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ABSTRACT

The expanded need for medical laboratory workers necessitates the recruitment of new personnel, and even more important, better utilization of present personnel. The development of a career ladder for laboratory workers would facilitate advancement as it would allow upward mobility for workers who could demonstrate knowledge and ability equivalent to that expected from those completing education and training for higher level positions. This study points out the need for equivalency examinations and summarizes information about equivalency and proficiency testing practices in the medical laboratory field, other health fields, and in other areas where experiences are applicable to the laboratory. An annotated bibliography which reviews the literature dealing with the need for equivalency exams is presented. Also included are various testing programs which are described in detail, each with information regarding purpose, method of development, format, concept, and aim of measurement. (CK)

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Equivalency and Proficiency Testing

Related to the Medical Laboratory Field

TM 000 596

NATIONAL COMMITTEE FOR CAREERS IN MEDICAL TECHNOLOGY

Bethesda, Maryland

March 1970

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As the work of medical laboratories has expanded in scope and complexity, manpower shortages have of course increased proportionately. Recruitment of new laboratory personnel is one answer to the problem; better utilization of present personnel is equally important.

Both recruitment and utilization of laboratory workers would be enhanced by development of a career ladder for the medical laboratory field. Such a ladder must allow upward mobility for workers who can demonstrate they have knowledge and ability equivalent to that expected from persons completing education and training for higher level positions.

Career mobility and equivalency were major subjects of discussion at the Conference on Manpower for the Medical Laboratory, sponsored by the National Committee for Careers in Medical Technology and the Cancer Control Program of the U. S. Public Health Service in October 1968. At that meeting, representatives of government and the professions concluded: "representatives of medical laboratory disciplines should initiate efforts with educational testing specialists to develop equivalency tests to provide increased mobility between levels and categories of laboratory careers."

As a first step in the effort to provide equivalency credit for laboratory workers, the National Committee contracted with the Allied Health Manpower Division of the U. S. Public Health Service to study the present role of equivalency and proficiency testing in the medical laboratory field, in related health fields, and in other fields where experiences are applicable to the laboratory. This report is the result of that study. The research was done by Mrs. Jean Linehan of the NCCMT staff.

The study points up the need for equivalency examinations in the field, and the present interest in and receptivity to the idea of equivalency among the professions and the educators.

Robert W. Coon

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EQUIVALENCY AND PROFICIENCY TESTING RELATED TO THE MEDICAL LABORATORY FIELD

The need for an increasing supply of health manpower has been well documented.[1] A number of factors have produced an expanded need for medical laboratory personnel even greater than that for health workers in general:

> Demands on the medical laboratory for services which aid in the diagnosis and treatment of human ills are increasing rapidly because of such factors as population growth, automation, new technology, and expanded health programs providing better medical care to all socioeconomic groups. An estimated 900 million laboratory examinations were performed on specimens from the human body in 1963; the number has been estimated to have reached about 1.4 billion during 1968. The rate of increase is expected to be even greater during the next several years.[2]

In 1975, according to a Labor Department estimate, an increase of 60% above the 100,000 medical laboratory personnel currently employed will be required, just to keep up with present procedures.[3]

While recruitment of new personnel is important to fill these needs, it is generally agreed that at least part of the solution to the increasing manpower shortage in the medical laboratory field is better utilization of those already employed. Ideally, the first step to improve utilization should be a thoroughgoing alanysis of the tasks to be performed in the laboratory. The task analysis would include assessment of the level of skills and personnel necessary to perform the tasks. Then educational programs would be designed -- and periodically redesigned -- to match the revised job descriptions.

Better utilization of health personnel would enhance career mobility within the system. Career mobility refers to the upward and lateral movement of personnel from one job to another as they gain knowledge and experience, with no artificial barriers erected to prevent such movement on the part of individuals who are qualified by virtue of knowledge and skills to perform the required tasks. Upward mobility includes the idea of the "ladder," allowing for promotion on the basis of measured abilities from the level of the aide, to that of the assistant, to that of the technician, to that of the technologist, and beyond. Horizontal mobility between health professions is based on the idea that a "core" of knowledge and skills is common to many health occupations, and would allow an individual to move from one field to another without duplicating the "core" training he had already completed. A system which provided for vertical and horizontal mobility would eliminate dead-end jobs and clarify the routes from one position to another. Those workers with ability and motivation could continue to advance.

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1. Among other places, in Education for the Allied Health Professions and Services, a report of the Allied Health Professions Education Subcommittee of the National Advisory Health Council, U.S. Department of Health, Education, and Welfare, 1967.
2. Guide Class Specifications for State Public Health Laboratories, U.S.Department of Health, Education, and Welfare, October 1969.
3. Technology and Manpower in the Health Service Industry, 1965-1975, U.S. Department of Labor, 1966.

Career mobility in the medical laboratory would make the profession more attractive, facilitate recruitment, retain present laboratory workers, and encourage re-entry into the field by those who for a variety of reasons have left it.

Basic to the concept of career mobility is the need to evaluate each individual's present abilities, regardless of the route he traveled to attain them, in order to allow his placement on the most appropriate rung of the career ladder. Proficiency and equivalency testing programs can serve as a basis for this evaluation. Proficiency testing assesses an individual's knowledge and skills related to performance at a specific task level. Equivalency testing equates learning gained off campus with the requirements of on-campus courses and formal training programs; it may lead to the actual granting of academic credit or may be used simply as a substitute for formal academic requirements.

Some Quotations on Equivalency and Proficiency Testing

A number of influential voices have been heard in recent years advocating the granting of credit for learning in other than formal and traditional programs. Many have advanced the need for equivalency testing -- in general, for the health professions, and specifically for the medical laboratory field. Some of the most pertinent are presented here.

John W. Gardner, in Goals for Americans, said in 1960:

> Many people who study outside the formal system do so for reasons having to do with their own fulfillment, and care little for academic credit. Others are concerned only with the immediate acquisition of skills, and credit is irrelevant here too. But many others do wish to obtain academic credit. We shall serve these people far more effectively when we have devised a flexible system of credit by examination. Such a system would assess and certify accomplishment on the basis of present performance. The route that the individual has traveled to achieve cmmpetence would not come into question. Such a system would permit many individuals to participate in higher education who now -- by the nature of their jobs or other obligations -- cannot do so.[1]

> Concern was expressed by the Senate Finance Committee in 1967 that:...The reliance placed on specific formal education, training, or membership in private professional organizations might sometimes serve to disqualify people whose work experience and training may make them equally or better qualified than those who meet the existing requirements. Failure to make possible the fullest use of properly trained health personnel is of particular concern because of the shortage of skilled health personnel in several fields.[2]

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1. Gardner, John W., "National Goals in Education," Goals for Americans: The Report of the President's Commission on National Goals, Prentice-Hall, 1960.
2. Senate Finance Committee report on the Social Security Amendments of 1967.

"Attention to equivalency of training is vital in both the professional and technical curriculums," according to the 1967 report of the National Advisory Health Council's Allied Health Professions Educational Subcommittee, which went on to say:

> Upward mobility should be encouraged but should be linked realistically with the capabilities of the individual. While it is desirable to have certain courses in a junior college accepted to credit in a senior college, it is perhaps more important to adopt the principle of credit for attainment in a field which could be tested by examination. There should be less concern for formal course requirements, and more for grasp of knowledge and skill. Programs should be designed to facilitate progress from the technical to the more advanced levels of education and practice in the health occupations.[1]

According to a report prepared by the NIH Bureau of Health Professions Education and Manpower Training, Division of Allied Health Manpower, and transmitted to the President and the Congress by the Secretary of Health, Education, and Welfare in April 1969:

> Methods must be developed to determine whether knowledge and skills acquired in other than formal academic settings are equivalent to the measures of "satisfactory" performance established in recognized educational institutions.
>
> The need for equivalency examinations for the allied health professions and occupations is based on the premises that: (1) students should not be required to repeat work that they have mastered; (2) objectives of course work can be achieved in other than classroom situations; (3) acquisition of knowledge and skills can be measured by examination and performance; and (4) educational institutions can use the results of these examinations as a basis for advanced placement or academic credit awards.
>
> Equivalency examinations have far-reaching implications for the health occupations. They could be used to accelerate the formal academic programs of potential health workers. They could also serve as bases for occupational mobility. The potential uses of equivalency examinations have special significance for many allied health workers who are locked in dead-end jobs, but who would be willing to undertake advanced academic training if they were given recognition for principles and techniques that they have already mastered. An example is the medical corpsman who is trained in the armed forces, but who cannot accept similar employment in civilian life because his military training and experience cannot be transferred readily to civilian employment requirements in many allied health occupational categories.[2]

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1. Education for the Allied Health Professions and Services, U.S. Department of Health, Education, and Welfare, 1967.
2. Report to the President and the Congress on the Allied Health Professions Personnel Training Act of 1966, as Amended, U.S. Department of Health, Education, and Welfare, April 1969.

Speaking as president of the Association of Schools of Allied Health Professions, J. Warren Perry, Dean of the School of Health Related Professions of the State University of New York at Buffalo, said to the A.M.A. Congress on Medical Education:

> A logical extension of the credit-by-examination concept must be conceived, developed, and fostered for the allied health professions. This is already being interpreted as one of the major needs if the mobility concept is to be achieved. The relationship of proficiency or equivalency testing procedure as might be applied to the allied health professions is self-evident, though putting it into practice will not be a simple task. If tests can be developed that will establish the common core elements involved in various health fields, measurement of the level of performance on a test might substitute for the actual taking of some of the now required courses in many fields. Based upon effective measurement devices of such proficiency or equivalency levels, it would not be necessary for an individual to begin at the very lowest level or rung of a ladder in an allied health field, but rather one could be admitted into an educational program or level of clinical functioning based upon his measured capabilities.[1]

R.L. Matkin, Assistant Secretary of the Council on Dental Education of the American Dental Association, has expressed his personal observations on the subject of equivalency examinations for health professions:

> The individual institutions conducting approved (accredited) educational programs should, in my judgment, be the agencies that determine equivalency. The equivalency could involve individual courses or the total program. For example, it seems appropriate that the responsible department or division of a school could develop "challenge" examinations in each subject matter area of a specific curriculum. The "challenge" examination should be as difficult as the usual final examination of the course. If the student is successful, he should be given credit for the subject matter area and not be required to take the course. Conversely, if the student is unsuccessful, he should be required to enroll in the course, provided he has met other criteria such as the usual pre-requisites, etc., expected of other students.
>
> Carrying this process to the ultimate, it may be possible that an individual would be able to successfully "challenge" all courses in a specific curriculum. If this is the case, it would seem reasonable that the institution would certify that the individual has knowledge and skill equivalent to its usual graduates and the individual should be considered eligible for certification or licensure examination.[2]

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1. Perry, J. Warren, "Career Mobility in Allied Health Education," J.A.M.A., Vol. 210, No. 1, October 6, 1969.
2. R.L. Matkin, in correspondence dated August 26, 1969.

Ralph C. Kuhli, Director of the American Medical Association's Department of Allied Medical Professions and Services, has expressed his personal support for equivalency testing for people with foreign education and experience, for discharged military medics, and for individuals with long and distinguished experience and training in a health occupation, as follows:

> Any and all useful education and experience should be credited, rachet-like. A person should always be able to go on if he can, if he wants to, and if he can afford it. Professions which do not allow credit for previous education and experience remind me of a limited access highway: once you get on it, you have to drive for miles before there's any chance to turn off or change direction.[1]

A conference on Manpower for the Medical Laboratory, bringing together persons from government and the professions, came out strongly in favor of equivalency testing for medical laboratory personnel:

> Recommendation 14: Representatives of medical laboratory disciplines should initiate efforts with educational testing specialists to develop equivalency tests to provide increased mobility between levels and categories of laboratory careers.
>
> Equivalency tests would make it possible for individuals to obtain science credits needed for advancement through recognition of self-study, experience, maturity, and skills gained on the job. Methods developed to equate experience with education and training can be used to evaluate correspondence, television, and continuing education courses as well as to enable graduates of armed forces laboratory programs to enter college or medical technology training without meeting traditional academic requirements.
>
> Efforts should be made to ensure recognition of equivalency tests by boards certifying and licensing laboratory personnel, and for admission to and advanced standing in colleges and universities.
>
> Development of equivalency tests would enhance the appeal of laboratory careers. The recognition of knowledge gained outside of formal education to fulfill academic and clinical requirements would give persons with initiative and ability opportunities for advancement.[2]

Speaking at the September 1969 meeting of the American Society of Clinical Pathologists, C. R. Macpherson, Chairman of the Board of Schools of Medical Technology, voiced both support for mobility and concern about the ways to achieve it:

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1. Ralph C. Kuhli, in correspondence dated July 25, 1969.
2. Manpower for the Medical Laboratory: The National Conference on Education and Career Development of the National Committee for Careers in Medical Technology, U. S. Public Health Service, 1968.

> Upward mobility in the laboratory is a very important concept, but its implementation presents problems. At present, to go from the assistant level to that of medical technologist, the worker has to go back to school and get a baccalaureate degree, which is impractical -- or impossible -- for most.
>
> We must study the possible mechanisms for upward movement, remembering that whatever we select cannot violate sound academic principles.[1]

Roma Brown, President of the American Society of Medical Technologists, has expressed the hope that the career ladder in the medical laboratory will "be viewed as a realistic continuum at every performance level," continuing:

> Constricture or an imposed ceiling will create a suppression on the rest of the system. Multiple mechanisms to achieve and recognize increased competency that are feasible for the individual must be structured. This will require innovative approaches by the educational system and cooperation by the service facility to encourage the individual to formally advance along the career line ....
>
> This will require a combined effort of the profession and the educational institutions to insure that educationally sound and professionally valid criteria are established. Measurable behavioral objectives need to be defined. Effective instruments for evaluating equivalency gained in both the informational and skill competency need to be developed. Management methods should be utilized that result in motivation of the individual to achieve maximum utilization of resources in the profession.[2]

Why Equivalency Testing?

The quotations presented above point to the need for equivalency and proficiency testing in general, in the health occupations, and in the medical laboratory field specifically. A summary of ideas for the medical laboratory field included in these quotations follows:

* There are increased demands on medical laboratories, and future demands will be even greater.
* Present shortages of skilled personnel in the medical laboratory field are expected to become a more serious problem in the future.
* Laboratories often are unable to utilize people to the full extent of their capabilities.
* Laboratories cannot give people the status to match the work they are often actually doing, and cannot move them up, because no standard system exists for granting credit for skills and knowledge gained outside formal educational programs.

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1. Tape recording of the session on "New Directions in Medical Technology Education and Evaluation," September 17, 1969.
2. From a paper entitled "Career Mobility: An Inquiry by a Health Profession Organization," read at the Association of Schools of Allied Health Professions meeting, November 1969.

* There is no route from the technical to the professional level in the laboratory except by returning to the beginning of the professional educational program.

* Laboratory workers who wish to upgrade themselves by returning to school find it difficult if not impossible to get credit for knowledge and skills they already possess, and thus must pursue contents and skills which they have already mastered. Since the return to school often requires sacrifices for the worker and his or her fanily, this additional handicap makes the return even more difficult and therefore less likely.

* Medical corpsmen who have obtained laboratory training and experience in the Armed Forces cannot move into the civilian health field at a level equal to their qualifications because they cannot get appropriate credit for their skills and knowledge.

* Workers in a health occupation find it difficult, if not impossible, to move to another health field unless they enter training programs again at the beginning.

* Elimination of dead-end jobs would make the medical laboratory field more attractive for recruitment and retention and re-entry of personnel.

Scope and Procedures of This Study

This study has been undertaken by the National Committee for Careers in Medical Technology, under contract with the Bureau of Health Professions Education and Manpower Training, Division of Allied Health Manpower, to collect and summarize information about equivalency and proficiency testing practices in the medical laboratory field, in other health fields, and in still other fields where experiences are applicable to the laboratory.

Equivalency testing refers to examinations used to equate non-formal learning with learning achieved in academic courses or training programs. Such tests may be designed to enable colleges and universities to grant academic credit for off-campus learning. They also may be used by employers or certifying bodies to qualify individuals whose non-formal study and on-the-job learning is deemed equivalent to that expected from a formal program.

Proficiency testing refers to the measurement of an individual's competency to perform at a certain job level -- a competency made up of knowledge and skills, and related to the requirements of the specific job. Such testing is therefore not only a measure of the knowledge gained through didactic instruction but also an assessment of job capabilities.

"Equivalency testing" and "proficiency testing" are thus not mutually exclusive terms. "Equivalency testing" relates to why an examination is given, and "proficiency testing" to what it attempts to measure. Equivalency tests for liberal arts subjects are not proficiency tests, of course, but equivalency tests in occupational fields usually are proficiency tests. Proficiency tests can be used for purposes other than equivalency to formal educational programs. The more closely an educational program is designed to relate to a specific job level, the more likely it is that an equivalency test for that educational program would also serve as a proficiency test to qualify individuals for that job.[1]

In undertaking this study, a review was made of available literature in the general field of psychological testing, in educational testing including testing for academic credit, and in testing in the health occupations. Books, periodicals, speeches, and reports were consulted. An annotated bibliography is included at the end of this report.[2] While the need for career mobility and for equivalency testing -- and the principles which support these concepts -- are well documented in the literature (see quotations on the preceding pages), it was necessary to go beyond a bibliographic search to learn what individuals and groups have done, are doing, and are planning to do in equivalency and proficiency testing.

Contacts have been made by letter, telephone, and in personal interviews with representatives of organizations in the health professions, with staff members of testing agencies, with laboratory directors, with state health department and licensing personnel, with Federal officials concerned with health manpower needs, with faculty members of colleges and of allied health schools, and with representatives of other organizations who had ideas and experiences to share.[3]

Testing programs described in this report are grouped in four sections:

1. Tests in the medical laboratory field,
2. Tests in other health fields,
3. Tests in non-health fields, and
4. Some non-test procedures for equivalency.

For each test covered in the report, we have included available information on the purpose for and methods used in its development, its format, content, and what it attempts to measure. We have also explored its uses, it candidates and their objectives, their relative success, what they have done with the test results, and retake procedures. We have examined a number of test instruments; many others were not available for review, due to test security reasons.

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1. In the test descriptions which form the bulk of this study, the term "proficiency testing" has for the most part been avoided, because it has a specific meaning in the medical laboratory field -- referring to evaluation of a laboratory's performance as a whole, not to that of an individual.
2. See annotated bibliography beginning on page 87.
3. See list of organizations and persons who have contributed information and ideas to this study, beginning on page 118.

A Practical Application Underway

During the progress of this study, the National Committee for Careers in Medical Technology has initiated the development of a battery of tests for use in the medical laboratory field. An initial purpose of the tests would be to offer equivalency credit toward part or all of a junior college medical laboratory technician program. Such tests could be taken by persons with laboratory experience who wish to move upward, or by military laboratory personnel who wish to obtain employment in the civilian health field. The test battery would include academic and clinical content related to the requirements of the majority of educational programs for medical laboratory technicians. The tests would be job-oriented because the junior college M.L.T. programs are themselves job-oriented. A performance evaluation would probably be included, in addition to the written examinations.

The test battery would be developed by the College-Level Examination Program of the College Entrance Examination Board, with the help of an ad hoc steering committee representing the American Society of Clinical Pathologists; the American Society of Medical Technologists; the junior college programs, through the American Association of Junior Colleges and the Council on Associate Degree and Certificate Programs of the Association of Schools of Allied Health Professions (A.S.A.H.P.); and the baccalaureate programs, through the Council on Baccalaureate and Higher Degree Programs of the A.S.A.H.P. -- for the present coordinated with staff work by the National Committee for Careers in Medical Technology.[1]

The Tests

Few generalizations can be made about the varied assortment of tests reported on here, since their purposes and construction are so varied. Yet it is possible to find some common characteristics among them.

Tests Designed for Academic Credit

The idea of giving college credit on the basis of examinations is not new. The University of Illinois began offering such examinations in 1895, and many other colleges and universities have had similar programs. The concept has had greatest impetus, however, since the founding of the New York State College Proficiency Examination Program (CPEP)[2] in 1962, and the College-Level Examination Program (CLEP)[3] of the College Entrance Examination Board in 1965. Both programs are designed to provide a way for mature individuals to demonstrate education achieved through means other than on-campus courses. Both offer examinations in subjects equivalent to college courses. CLEP also offers General Examinations which are designed to measure general educational background of students who have the equivalent of a year or two of college. Nearly 500 colleges nationwide have indicated they are willing to grant credit for the CLEP examinations -- and the number continues to grow. Likewise, the majority of colleges and universities in the State now grant credit on the basis of the New York CPEP tests.

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1. See detailed description beginning on page 28.
2. See detailed description beginning on page 45.
3. See detailed description beginning on page 49.

The most liberal credit-by-examination program in the allied health fields probably is the one offered by Division of Health Sciences at Northeastern University, where a new equivalency examination in respiratory therapy has recently been developed. The program offers up to one-third of the credits needed for the associate degree. Anyone who passes it and can also pass CLEP tests for the courses making up the remaining two-thirds of the program may earn an associate degree from the University solely by examination.[1]

Miami-Dade Junior College in Florida is developing a credit-by-examination program which will allow for as much as 45 credits in its 60-credit program. Students in the Division of Allied Health Studies who are licensed or certified in their particular field are given credit for all the technical courses, provided they take one on-campus laboratory course in their field.

Examinations are being given at a number of institutions for licensed practical nurses who wish some credit on entering training programs, registered nursing, and/or for non-baccalaureate RN's who wish to return to school for their degrees. The New York College Proficiency Examination Program has developed a battery of tests in the nursing field which are accepted for credit by more than half of the nursing programs in New York State. SUNY at Buffalo grants up to 32 credits for the four nursing examinations offered in 1968 and 1969 by the New York CPEP program. Nursing schools, such as those at Indiana University, California State College at Los Angeles, Medical College of Georgia, the University of Arizona, and others, have made up their own tests to offer such credit, or use tests designed by the National League of Nursing for other purposes, such as selection and guidance of applicants for admission or comprehensive testing of achievement at the end of senior year.[2]

Syracuse University has a comprehensive credit-by-examination program, which makes use of CLEP and CPEP tests, as well as tests developed by its own faculty, to grant up to 30 semester hours of credit. Similar programs are underway at Boston University and Louisiana State University. There is no limit to the number of credits attainable by local and standardized examinations at Beaver College in Pennsylvania. Brooklyn College and the University of Oklahoma offer some credit in their special baccalaureate degree programs for adults on the basis of examinations.

The above are not a representative sampling of the use of credit-by-examination programs but are merely examples of the kinds of programs currently offered. In a limited survey by J.A. Hedrick[3] ten years ago, 171 of 300 North Central colleges and universities granted credit by examination. No recent figures are available, but the trend seems to be toward greater use of such programs as standardized tests have become available. Most allied health schools are just beginning to consider the problems of equivalency testing. But it is a subject of considerable concern to them today, as evidenced by the fact that both the two-year and four-year Councils of the Association of Schools of Allied Health Professions indicated at their organizational meetings in November 1969 that equivalency and career mobility would be a major program emphasis in the coming year.

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1. For more information about these and other credit-by examination programs, see the section on Credit-by-Examination Programs of Colleges and Universities on page 52 of this report, and the section on Practices of Allied Health Schools in Granting Credit by Examination, on page 57.
2. For further information on examinations for nurses, see the section on Nursing Examinations on page 37 of this report, as well as the bibliography.
3. See Bibliography, item number 61.

Test Eligibility and Prerequisites

There are no prerequisites for taking equivalency tests designed to give academic credit -- particularly those of CLEP and CPEP -- unlike virtually all licensing, certification and employment examinations. To fulfill the basic concept behind equivalency, tests must measure current knowledge, no matter how it has been gained.

Many of the tests covered in this report do not pretend to offer this kind of equivalency, of course. Most are buttressed by eligibility requirements, and thus by themselves do not attempt to do a complete job of measuring an individual's knowledge and skills. For example, the Board of Registry of Medical Technologists has very specific education and training requirements for the medical technologists who wish to become eligible for its Registry Examination.[1] The National Board of Medical Examiners gives the first two parts of its examination to students in medical school and Part III to those just finishing a year of internship.[2] The American Board of Pathology requires a full pathology residency, or eleven years of experience in pathology, following graduation from medical school.[3]

In virtually every case, the licensing, certification and employment tests covered in this report are given only to persons who have completed a certain course of study or to persons who have had a certain number of years of experience. The equating of experience with education on a formal basis -- with so many years of experience being equivalent to so many years or credits of education, as is the case with the U.S. Civil Service and many other agencies -- is a pattern emphasizing "time served" just as much as is reliance purely on years of formal education. Some experts believe it is possible and advisable to devise tests so good that they would do the necessary screening job themselves. Dr. George P. Vennart, Chairman of the Board of Registry of Medical Technologists, has stated that the Board's registration examination will not be truly effective until it is such a good measure of knowledge, techniques and attitudes that it can be opened to everyone, irrespective of the route he traveled to gain the requisite knowledge, techniques and attitudes, or of the time involved in doing so.[4]

Other Equivalency Tests

As noted above, several equivalency tests are designed to waive academic credit, not to grant it, and thus to qualify an individual for promotion or certification.

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1. See detailed description beginning on page 1.
2. See detailed description beginning on page 31.
3. See detailed description beginning on page 6.
4. For Dr. Vennart's statement, see page 3 of this report.

The CLEP General Examinations are used in this way by a number of state agencies. In one state, bar examiners require the examinations of all applicants for the bar exam who do not have college degrees. The library certification board in another state uses the examination to enable a candidate for certification to demonstrate knowledge which is equivalent to two years of college. At least one major company has used the examinations similarly for promotion purposes.

The U.S. Public Health Service has sponsored an examination for certain directors of independent laboratories, the successful completion of which would qualify their laboratories to participate in the Medicare program, despite their lack of the required education and experience qualifications. Laboratory directors without a bachelor's degree in a laboratory science plus at least six years of pertinent laboratory experience can demonstrate through this test that they possess adequate knowledge and skills to perform the job. These directors must pass the general portion of this multiple-choice examination, and those of the five specialty portions for which they want their laboratories to qualify. The proficiency examination was developed by the Professional Examination Service of the American Public Health Association, and has been given since 1967 to 474 non-degree directors, 394 of whom have passed and thereby qualified their laboratories to participate in the Medicare program.[1]

A proficiency test with a similar purpose is now being developed for the U.S. Public Health Service to evaluate the knowledge and skills of state-licensed physical therapists who do not have full professional training but who wish to qualify for full participation in the Medicare program. The examination is being constructed by Cybern Education Inc. for administration early in 1970.[2]

Proficiency Testing

As noted above, proficiency testing attempts to measure the knowledge and skills necessary to perform a certain task. Virtually every testing method can be and is employed for proficiency testing in the health fields.

Multiple-choice written examinations are most often used to test knowledge, although there are or have been several essay or short-answer written examinations.

Performance tests, which measure skills and the ability to apply knowledge to the job, have traditionally consisted of a "work sample" done under the eye of a trained observer. Only a few of these are currently in use. But new techniques are enabling testing agencies to simulate situations in which the candidate can demonstrate his "performance" on paper without actually doing the job.

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1. See detailed description on page 8.
2. See detailed description on page 41.

Written Examinations

The large majority of examinations described in this report are written examinations, with several hundred multiple-choice questions, measuring mostly recall of information. The content may be theoretical, such as might be included in an educational program, or it may be completely job-oriented without regard to formal courses. The sponsoring organizations generally assert that a major aim is to test thought processes beyond mere recall of isolated facts. Probably fewer of these tests than their sponsors claim actually test these thought processes.

In their 1968 study for the World Health Organization on the worldwide use of examinations in medical education, Josef Charvat, Christine Maguire and Victor Parsons identified the overemphasis on recall of isolated fragments of information as a major fault of testing in the medical field. They noted that efforts are underway to make examinations include more interpretive items.[1]

In this regard, the plans of the Board of Registry of Medical Technologists for development of its future examinations for registered medical technologists are among the most forward-looking. The Board's goal is to produce an examination in which 20% of the questions will test the recognition or recall of isolated information (e.g., "What is X?"), 40% will test the simple interpretation of limited data (e.g., "How do you interpret X? What does it imply? Knowing X to be true, what would you expect to be true about Y?"), and 40% will test the evaluation and the application of knowledge to the solution of a specific problem.

Performance Testing

While there is concern in many testing agencies about the need to evaluate performance, there is no agreement on whether any of the ways of performance testing are reliable or valid, whether they can be made sufficiently objective, whether they actually test anything not included in paper-and-pencil examinations, and thus whether they are worth the cost they entail.

Some specialists in testing believe that those who know what to do, can do it. They say performance tests correlate so well with written tests that performanke testing adds nothing to evaluation of a candidate. Others believe it is both possible and useful to devise tests which measure an individual's ability to perform in an actual job situation. Examples of these contrasting views follow.

A traditional so-called "practical" performance test was originally part of the Registry Examination of the Board of Registry of Medical Technologists, but was dropped when analysis of the results showed the practical portion was not screening out anyone who passed the written test.

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1. See Bibliography, item number 25.

The only practical examinations including work samples in the medical laboratory field today appear to be state civil service examinations in Illinois and California and a series of licensure examinations in New York City.

In Illinois, candidates for Laboratory Technician ratings must demonstrate their ability to perform specific laboratory tasks and their knowledge of equipment and techniques in twenty minutes before an interviewing board. The board asks questions about procedures and equipment, and requires performance of a simple procedure such as a blood count. It rates candidates on personal qualities, job knowledge, practical application, and an over-all assessment of ability. The State Department of Personnel developed the practical test to identify those who do not understand laboratory procedures even though they may be able to answer written questions. Of those who pass the written test, more than 15% fail the performance test.[1]

The California State Personnel Board has designed a new performance test in the laboratory field for a different purpose -- to meet the needs of persons who have trouble with the content of written tests for entry level positions. The new test for Laboratory Assistant I, which takes the place of the written examination, calls for the candidate to identify laboratory equipment, to read charts regarding the decontamination of equipment, and to segregate laboratory items so as to show which are usable and how they must be sterilized.[2]

New York City's Bureau of Laboratories in the Department of Health gives practical examinations supplementing its written tests for certification of laboratory personnel -- from laboratory directors on down -- who do not have the required education and experience. Laboratory directors are examined by three competent specialists for one-half day, with no pre-determined pattern. Examiners aim generally at answering the question: "Would you leave this candidate in charge of your own laboratory?" Laboratory supervisors are tested for two hours by two examiners; technologists and technicians are tested for one hour by one examiner each. Each candidate on these lower levels is given one structured problem to work out.[3]

Some of the problems besetting practical examinations in the laboratory field were illustrated by the work sample intended to form part of a battery of tests administered to medical technicians at Veterans Administration hospitals. The Educational Testing Service administered these tests in connection with its joint study with the Civil Service Commission of test and job performance of Negroes and whites. The one-hour work sample suffered from space limitations and from lack of appropriate and uniform equipment. Although this work sample produced no usable results, experts at Educational Testing Service believe it suggested another set of more productive (and more costly) procedures, including the use of uniform, high quality equipment, and the presence of professional medical laboratory observers.[4]

A 1959 study of various means of selecting dentists for Regular Corps commissions in the U.S. Public Health Service reported high correlations between practical and written examinations, and suggested therefore that other methods may be fairly satisfactory substitutes in situations where practical examinations are not feasible.[5]

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1. See detailed description beginning on page 15.
2. See detailed description beginning on page 16.
3. See detailed description beginning on page 13.
4. See detailed description beginning on page 18.
5. See detailed description on page 39.

The Certifying Board of the American Dental Assistants Association has recently dropped the observed work sample which formerly was a major part of its examination. The major reason for the change was that virtually everyone who passed the written examination also passed the performance examination. The latter had required the services of some 1,200 examiners, and the Certifying Board concluded the money and manpower expended were not worth the results. The new written test incorporates most of the former practical problems through the use of photographs and other means. Several practical problems are still included in the test, but each of these has a product, such as developed and mounted Xrays, which the candidate sends to the Board's headquarters for evaluation.[1]

Most of the agencies and organizations interviewed for this present study "have no plans" for performance tests. One that does is the New York College Proficiency Examination Program, which is developing guidelines for a practical examination in medical surgical nursing to supplement its written test. The performance portion of the examination will be made available to individual colleges of nursing to administer themselves.

New developments in testing indicate that it is possible to devise performance tests which do not call for actually doing the job. One alternative requires identification and comparison of pictured or oral phenomena, in which answers fit into a multiple-choice format. The practical portions of the American Board of Pathology examinations, for example, make use of slides, photographs and fixed specimens in this way.[2] The National Board of Medical Examiners uses movies and photographs in its "Part III" evaluation of clinical competence.[3] The California licensing examination for laboratory directors who are bioanalysts includes a three-hour practical examination consisting of slides to identify.[4]

Simulation of practical problems in a pencil-and-paper format is a development in performance testing which is attracting increasing attention. The Orthopaedic Training Study[5] and the National Board of Medical Examiners[6] have developed "programmed testing" in which a candidate follows through on paper with a clinical diagnosis and treatment situation in which the way he answers each question determines the information he will have available to answer the following questions. This type of testing is sometimes called a "tab test" because the candidate pulls off a tab or erases a special coating under which he finds the information he thinks necessary for the diagnosis. Such programmed testing bears further study for its possible uses in the medical laboratory field.[7]

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1. See detailed description on page 40.
2. See detailed description beginning on page 6.
3. See detailed description beginning on page 31.
4. See detailed description on page 11.
5. See detailed description beginning on page 35.
6. See detailed description beginning on page 31. Note also that the Part III examination of the National Board has correlated between 0.30 and 0.65 with the other two parts, which are written, indicating Part III is indeed measuring something the other parts do not.
7. For a sample of a suggested programmed test in the medical laboratory field, see page 23 and Appendix 5 on page 78.

Another procedure which may be adapted usefully for the testing of individual performance is "proficiency testing" for quality control, designed to test the performance of a specific laboratory as a whole.[1] Such programs have been available to laboratories for years, through the College of American Pathologists and the American Association of Bioanalysts, and through individual states. They have recently become mandatory for laboratories under Medicare provisions and Federal interstate licensing regulations administered by the National Communicable Disease Center.

"Proficiency testing" programs of this kind involve the mailing of samples, which the laboratory is to process in its regular manner along with the day's regular work. The laboratory's report of its findings is compared with results obtained by several selected reference laboratories and with results from other participating laboratories. Comprehensive reports are provided for all participants. Errors in results can aid laboratory directors in the correction of weaknesses in laboratory performance.

The Clinical Laboratories Improvement Act of 1967 requires laboratories which engage in interstate commerce to undergo such "proficiency testing." Such laboratories must be licensed through the National Communicable Disease Center (CDC), unless they are accredited by the College of American Pathologists and take part in the College's comprehensive "proficiency testing" program. CDC licensing requires laboratories to participate in CDC's own "proficiency testing" service.

The CDC program serves as a standard against which the states can measure their own "proficiency testing" programs. An incentive to improvement of such state services is that they may be substituted for the CDC "proficiency testing" program when CDC deems them to be sufficiently stringent. To date only the programs of Wisconsin and New York (excluding New York City) have been so judged.

Questioned for this study, the directors of the major "proficiency testing" programs agreed that this sort of procedure could readily be used for testing individuals, rather than entire laboratories. This is the stated aim of the newly-established Educational Performance Proficiency Program sponsored by the American Medical Technologists.[2]

Problems of Transferring Laboratory Experience

A maze of different systems confronts the individual attempting to plan a career in the health field, and specifically in the medical laboratory. The only unhampered route to a career as a medical technologist begins with college and leads through clinical training in an AMA-approved school of medical technology to a baccalaureate degree. Any delay or deviation from that route is severely discouraged by the confusing array of systems.

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1. See detailed description beginning on page 9.
2. See detailed description on page 22.

There is very little relationship between the educational system and the world of the working laboratory. It is usually not possible for a laboratory worker to gain academic credit for his experience, or for the learning he may have obtained in ways other than through formal academic courses. There is no accepted articulation between the newly-established associate degree medical laboratory technician level of training and the baccalaureate medical technologist course of study.

The military and civilian and governmental laboratory systems are so constituted that it is difficult to transfer experience from one to the other. Military-trained laboratory workers cannot get recognition in the civilian laboratory field commensurate with their military training and responsibilities. There is current interest in various manpower units of Federal agencies regarding the employment of military-trained medical personnel in the civilian health sector. However, military laboratory specialists cannot transfer even into equivalent government positions because U.S. Civil Service regulations require formal educational background.

No procedures exist in either Federal or state civil service systems for laboratory workers to proceed from the technician level to the professional technologist level without formal academic study. The Medicare program and the interstate laboratory licensing program administered by the National Communicable Disease Center both now require participating laboratories to submit to tests of over-all laboratory proficiency for quality control purposes; yet both programs have personnel qualification requirements as well. And these requirements do not allow for learning outside formal academic programs.

Professional certification through the Registry of Medical Technologists provides some measure of uniformity in the field, as do model state licensing systems. Yet both require only formal education and provide no real alternatives to the "accepted" route for becoming a medical technologist.

The Need for Equivalency Examinations

A major impediment in transferring experience from working situations to the educational system, or from military to civil service to private laboratory systems, is that no means now exists to measure a laboratory worker's knowledge and skills as related to the job or as related to academic requirements. Proficiency testing, on the one hand, and equivalency testing, on the other, could help to provide the necessary bridges between these systems.

The encouraging trend noted in speeches, articles, correspondence and conversations is that many individuals and organizations representing the health professions are concerned about evaluating the capabilities of people working in the health fields, and particularly in laboratories, and are considering new ways of giving those workers recognition for what they have learned. There is a growing acceptance of knowledge gained outside the classroom and of the possibility of measuring that knowledge.

Meanwhile, testing agencies and experts have developed more sophisticated examination techniques for evaluating the whole spectrum of learning, including not only recall of isolated facts but also the ability to use these facts and to understand relationships. New simulation methods, including paper and

pencil tests, have been devised for testing performance abilities. Methods of job analysis are being employed -- particularly the critical incident technique -- to define the knowledge and skills which are necessary for each job. With this information, test preparation can be aimed specifically at the job under consideration. Tests in the health fields, as in most fields, are subject to continuous re-examination to assure that they measure what they are intended to measure.

The findings of this study point both to the need for equivalency testing in the medical laboratory field and to possible ways of meeting that need. A battery of examinations could and should be developed to evaluate the knowledge and skills of laboratory workers.

Efforts to achieve career mobility in the medical laboratory field should proceed concurrently in these three directions:

* Identification of skills and knowledge which are needed currently as well as needs in the future to perform the various tasks in the medical laboratory;

* Redefinition of educational programs to prepare workers specifically to perform these tasks; and

* Development of tests which measure on-the-job proficiency and can thus be used for equivalency purposes to grant academic credit, and/or recognition of competence.

To delay the third for completion of the other two might be logical, but would in fact be tantamount to doing nothing about equivalency, since both task analysis and educational change are long-term undertakings. The need for equivalency examinations is immediate.

The examinations thus should be constructed within a flexible framework that would permit modifications as task analysis provides agreement on what is required of medical laboratory personnel, and as educational programs continue to change in order to train personnel for the tasks to be done.

II. A BRIEF HISTORY OF EQUIVALENCY TESTING *

By Sarah Allene Wise, MT(ASCP)

Historically the development of equivalency examinations was a result of the identification of two purposes for which they were given. These purposes, to award academic credit and determine partial fulfillment of job requirements, required the development of two corresponding types of tests. These purposes are not mutually exclusive as could be assumed by such an arbitrary division; there is a point at which job mobility may, and often does, depend on acquired academic credit. Historically, these two types of tests have developed somewhat concurrently; but presently the trend is to provide a single instrument which can serve both purposes.

History

Early in its development, equivalency testing focused on the superior high school student who desired credit or advanced placement. The result of a number of schools attempting to meet this need was the availability of a variety of such examinations, many of which are currently used for this same purpose. These examinations are known by various titles: the anticipatory-examination; the exemption examination; proficiency examinations and advanced placement examinations.

By the end of World War II, the literature indicates that many schools had become interested in developing methods for evaluating various learning experiences which had not been acquired in an academic classroom setting. In 1945 the Commission on Accreditation of Service Experience was established by the American Council on Education to review the educational programs of the Armed Services and make recommendations for credit for such experiences. At about the same time, the General Education Development Tests of the United States Air Forces Institute were constructed to allow credit to servicemen for a variety of educational achievements obtained in the military service. By the successful completion of these equivalency examinations, a serviceman (and later non-service persons) could earn a high school equivalency certificate.

Paralleling the development of equivalency tests for academic credit was the development of tests designed to ascertain a candidate's qualifications for meeting the requirements for a job. The equivalency examination, as used in job mobility, has been recognized for many years by industry, government agencies and organizations as a means of evaluating an employee's qualifications for moving to a better paying job or a new position with new responsibilities. Originally this mobility was dependent upon work experience alone, but with the increased availability of facilities for higher education, the various levels of employment frequently became geared to the acquisition of academic credit or its equivalent. Many forces -- educational, economic and individual -- acting at the same time brought into focus the importance of the acquisition of academic credit or its equivalent to meet this additional job requirement.

Several educational institutions have prepared tests whereby an individual's experience can be evaluated and possibly equated to the first and second year of college. In 1960, the New York College Proficiency Examination Program was developed which provided a measure of the learning equivalent to the first and second year of college and, in addition, provided a measure to be used in the

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* Quoted by permission of the author from an unpublished master's thesis entitled "A Method for the Preparation of a Challenge Examination in Medical Technology," University of Vermont, 1969.

partial fulfillment of the requirements for teacher certification. Thus, one instrument was developed which could be used for the dual purpose of evaluation for credit and/or job requirement. This examination was for use in a limited geographical area. On a national scale, the College Level Examination Program was prepared by the College Entrance Examination Board. The program began in 1965 and was expanded later to provide an equivalency instrument which can serve either of the purposes of equivalency. As indicated in its literature, the College Entrance Examination Program provides test results which can be used by universities or colleges to provide credit, or by some organizations, licensing bodies "and agencies other than colleges and universities" as a fulfillment of some requirements.

Within the past few years, various groups and organizations have been interested in the development of methods for evaluating the learning acquired from off-campus experiences. Much of this emphasis has been a result of pressure, directly or indirectly, from the findings and observations of various programs and studies by the United States Department of Health, Education, and Welfare and the Department of Labor. Many of the studies have been concerned with the development of career ladders, new careers, subprofessional employees, and/or suggestions for a more flexible means of job mobility. The ideas which were reported in these studies have become closely associated with equivalency examinations since, frequently, examinations provide the means of achieving mobility in employment. These examinations, then, evaluate the acquisition of learning associated not necessarily with specific academic experiences but with those of possible equivalent value. Much of the current work in equivalency testing is directed toward such evaluation.

Many current university and college catalogues indicate that equivalency examinations are available to students who desire credit or advanced placement. These are often prepared by the institution itself, however many use as equivalency measures various tests from the College Level Examination Program. Organizations and groups in a variety of occupational fields have employed the College Level Examination Programs to determine partial fulfillment of their qualification requirements. The need for equivalency examinations in the health field has been stressed by many authors; but only recently has this become a major concern for several organizations and professional representatives in the health field.

Nursing educators have been investigating and studying this problem for several years. In 1967 a conference on manpower problems in the medical laboratory was held by representatives of various government agencies and of the professions interested in the medical laboratory field. As a result of its discussions, the conference made several recommendations, one of which was that "efforts ... (should be made) ... to develop equivalency tests to provide increased mobility" in the medical laboratory field.

TESTS IN THE MEDICAL LABORATORY FIELD

THE BOARD OF REGISTRY OF MEDICAL TECHNOLOGISTS EXAMINATIONS

The Board of Registry of Medical Technologists, established in 1928 by the American Society of Clinical Pathologists, has been examining candidates for certification since 1933.

A brief history of the Registry's examinations was furnished by Dr. Lall G. Montgomery, who was chairman of the Board of Registry for 24 years.

The first candidates were rated on a written essay-type examination, which counted 25%; a practical test, 50%; and "personal and psychological attributes, endorsements and recommendations, present position, and previous general training," 25%.

"Suggested" procedures for the performance test in the laboratory were given the examiners, but no uniform method was provided for evaluating performance. Examiners were simply instructed to express "on a basis of 100" their rating of ability as shown by the practical test and their assessment of the applicant's "personality, general character, personal appearance, and personal neatness."

All ratings were submitted to the Board, which considered each applicant individually.

By 1937, the examination of applicants was based only on the written and practical examination, with equal weight for each, and this continued to be the pattern until 1944. During this period, the Board's memoranda to examiners indicated concern for the need to standardize the examining methods used in various parts of the country.

In the attempt to achieve such standardization, the Registry:

*made the required tasks more specific,
*explained to examiners the purpose behind each task, giving them an idea of what to look for in the performance,
*warned against deviation from the indicated procedures except "when absolutely necessary,"
*asked examiners for a percentage grade on each task, with 70% required to pass, and
*indicated ratings should be based on: "(1) skill and accuracy in manipulation, (2) knowledge of procedure, including apparatus involved, (3) neatness and asepsis in technic, (4) reasonable speed, and (5) thoroughness in observation."

A copy of the last practical examination, of Spring 1944, is Attachment 1 on Page 64 of this report.

The practical examination was discontinued in the Fall of 1944. As Dr. Montgomery explains:

> The decision to stop using the practical section of the examination was based on two main considerations. The first was the fact that the war had caused serious restrictions in travel and also had burdened those of us who were on the homefront with responsibilities and staff shortages as well as material problems that made the practical examination almost insurmountable for most pathologists and their staffs.
>
> The second consideration was the evidence provided by a study of the results of the failing rates for those who took the examination as regards their failure in the practical and written sections. It was found that the vast majority of those who failed the practical examina-

tion also failed the written examination, and that the practical examination, from the standpoint of effectiveness, added only one or two percentage points to the effectiveness of the written examination, and this was far less than the probable error of the two methods.

There was, as you might expect, a moderate amount of objection raised to the discarding of the practical examination, and yet as I look back on the transitional period, I am surprised how little objection was raised and I am almost certain that most pathologists and their staffs felt that the practical examination was more of a gesture than an accurate educational measurement.

There was no doubt that the formality and the structuring of the examination was markedly different in different laboratories and although I am sure the great majority of pathologists attempted to do serious and careful evaluation of the candidates, the fact that each laboratory would have different materials and different staffs made it obvious that evaluation would leave a very wide margin of variability.

Today, the Registry examination consists of 200 written multiple-choice questions, with the following distribution among laboratory fields: 40 in hematology, 50 in microbiology, 50 in chemistry, 40 in immunohematology (of which 20 are in blood banking and 20 in serology), 10 in urinalysis, and 10 in histology.

To be eligible for the examination, a candidate must have completed at least three years of collegiate work (with specific course work in biological sciences and chemistry) and a one-year course at an AMA-approved school of medical technology. In addition, a candidate with a baccalaureate degree (with the same science courses) and five years of acceptable clinical laboratory experience may take the examination.

Some 3,000 candidates take each of the examinations, given semi-annually in about 170 centers throughout the country. The examination is graded on a curve, with the passing cutoff point set at one standard deviation below the mean, which results in about 16% failure.

Three types of questions are included on the examination, according to a recent memorandum from the Board of Registry to the approved schools of medical technology:

> Level 1: RECALL. Questions testing primarily the recognition or recall of isolated information; such questions require predominantly an effort of memory. They include, for example, recognition of typical morphologic lesions, or the recall of specific facts, generalizations, concepts, principles, processes, procedures, or theories. Whether or not it is specifically so formulated, such a question will ordinarily be asking: "What is X?"
>
> Level 2: SIMPLE INTERPRETATION. Questions testing primarily simple interpretation of limited data. Such questions require more than simple recall, but less than problem-solving. They include, for example, questions that require translation into another form of specific verbal, tabular, morphologic, or graphic data which are new to the student, interpretation or extrapolation from such data, and recognition of the constituent elements and relationships among such data. Questions at this level will ordinarily be asking: "How do you interpret X? What does it imply? Knowing X to be true, what would you expect to be true about Y?"
>
> Level 3: PROBLEM SOLVING AND EVALUATION. Questions testing primarily the application of knowledge to the solution of a specific problem and the fitting together of a variety of elements into a meaning-

ful whole. Items of this type may be based upon actual clinical laboratory situations which require the student to make judgments regarding priorities and the need for modification of laboratory procedures. Alternatively, such questions may be based upon a research report or the presentation of a theory, together with evidence, which will require the student to evaluate the total presentation.

It is the eventual goal of the Board that the examination should consist of 20% Level 1, 40% Level 2, and 40% Level 3. This is in conformance with the concept that the M.T.(ASCP) should have a thorough understanding of pathological physiology as it relates to the performance of laboratory procedures.

According to George P. Vennart, M.D., Chairman of the Board of Registry, the Board is working toward the following additional changes in the Registry examination:

* Offering optional questions in such areas as data processing, cytogenetics, management, isotopes, etc., to allow for more flexibility in the examinations -- and in the training programs they influence. Required questions in the basic fields would of course continue to dominate the examination.
* Including the same types of questions as are on the examinations of the National Board of Medical Examiners -- anecdotal problem situations, photographs, and slides for identification and analysis, aiming not at diagnosis, but at a basic understanding of patho-physiology.
* Reducing the number of examination centers to allow for the use of audio-visual aids, and for the setting up of a "practical" examination.

Joint efforts with professional groups in microbiology, clinical chemistry, and the like, are being developed. Recognition for categorical specialists at all levels is being considered. And international reciprocity of registries is another aim.

An even larger aim is that espoused by Dr. Vennart for some years, and stated most recently in October 1969 at an Airlie House meeting of representatives of the junior college community and the professionals involved in the education of medical laboratory personnel:

> Currently, licensure and certification examinations are widespread, and almost uniformly are an insult to one's intelligence! Their only usefulness appears to lie in the fact that high quality education and background training are necessary prerequisites for entrance to the examinations. If we are able to structure our examination to really measure what knowledge, techniques, and attitudes we know are the hallmarks of laboratory quality, then we shall have a meaningful certifying program. To be truly effective, we must open such examinations to groups of individuals who have NOT taken the prescribed, usually stereotyped, ofttimes antiquated, training programs at any given level.

In addition to its examination for Medical Technologists, the Registry conducts the following certification examinations:

Blood Banking

The examination in Blood Banking was created and is administered in cooperation with the American Association of Blood Banks. To be admitted to an approved school in the field, a candidate must be a registered Medical Technologist, or have a B.S. degree and one year's acceptable experience in a clinical laboratory. The training program then takes one full year, after which a candidate is eligible for the Registry's examination.

Beginning in 1970, those with at least five years' experience but without formal training in blood banking will be eligible to take the examination, if they meet the requirements for admission to a school of blood banking, as shown above. A master's degree in immunohematology may be substituted for two years of experience.

The examination has both written and practical portions. A candidate must first pass the multiple-choice written examination. Within a year, he must pass the practical examination, which requires him to analyze blood samples sent to him by mail.

Cytotechnology

A candidate is eligible for the cytotechnology examination if he has completed two years of college with certain courses in biology and science, six months of training in an AMA-approved school of cytotechnology, and six months of acceptable experience.

A multiple-choice written examination is followed by a practical examination consisting of projected 35 mm. transparencies for identification. According to the announcement, the candidate should be familiar with standard textbook information and also with recent advances in the field of cytology.

Histologic Technic

A high school diploma plus one year of training and experience qualifies one to take the examination in Histologic Technic. A written, multiple-choice examination must be passed first. Then, for the practical portion of the test, the candidate is required to submit certain slides by mail.

Nuclear Medical Technology

There are several routes to eligibility for the examination in Nuclear Medical Technology, since there are few training programs in the field. A candidate may have one of the following combinations of education and experience in a clinical radioisotope laboratory: (1) ASCP registration as a Medical Technologist, plus one year of experience, (2) a B.S. in biology or chemistry or physical sciences plus two years of experience, (3) two years of college with courses in sciences plus four years of experience, or (4) high school diploma plus six years of experience.

The examination is aimed at on-the-job learning. It is a written, multiple choice test, 50% of which is devoted to diagnostic procedures, 10% to radiologic safety, and 40% to physics, mathematics and statistics, and instrumentation.

Chemistry

A candidate with a bachelor's degree and a major (or the equivalent) in chemistry, plus one year of experience in chemistry in an acceptable medical laboratory may take the certification examination in Chemistry. The written, multiple-choice examination covers "the chemistry of any part of the body, or body fluids, as well as instrumentation, chemical mathematics, and nomenclature."

Microbiology

A candidate for the examination in Microbiology must have a bachelor's degree with a major (or the equivalent) in bacteriology, plus one year of experience in microbiology in an acceptable medical laboratory. The examination, also written and multiple-choice, includes bacteriology, serology, immunology, parasitology, and mycology.

Specialist Certification

Designed to recognize training and experience at a higher level than the baccalaureate, the Specialist certification is open to persons who have (1) a master's or doctorate in a specialty plus three years of experience in the specialty, or (2) a baccalaureate degree, certification as a registered Medical Technologist -- M.T.(ASCP) -- and five years of experience in a specialty.

This certification is available in the fields of hematology, microbiology, chemistry, and cytotechnology.

The Specialist examination is in three parts: an essay test, a multiple-choice objective test, and an oral interview. Candidates must pass the first two sections to become eligible for the oral examination. If the candidate fails any section, he must repeat the entire examination.

Medical Laboratory Technician

The Board of Registry's newest examination is that for Medical Laboratory Technician. For full information about the several ways a candidate may become eligible for this certification, see the section of this report beginning on Page 280.

The examination, given for the first time in November 1969, is a written multiple-choice test.

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Certified Laboratory Assistant

A separate Committee on Certified Laboratory Assistants, working under the Board of Registry and the Board of Schools of Medical Technology, administers examinations once a year to candidates for Certified Laboratory Assistant certification.

Candidates must be graduates of an approved 12-month hospital-based school or of an approved military medical laboratory course.

The examination consists of approximately 200 multiple-choice questions, covering both didactic and on-the-job knowledge.

AMERICAN BOARD OF PATHOLOGY EXAMINATIONS

The American Board of Pathology has offered examinations in the specialty of pathology since 1937.

In its early forms, the Board's testing program consisted of essay-type written questions and oral/practical examinations in the laboratory. Both sections of the examinations have since been modified, so that today they consist solely of machine-graded multiple choice items. Some of these are answers to written questions on theory and practice. Others are diagnoses of slides, photographs or actual specimens.

The Board's description of the examinations is as follows:

ANATOMIC PATHOLOGY

1. A two-and-a-half-hour, multiple-choice, written examination on theoretical, interpretative, and statistical aspects of anatomic pathology.

2. The diagnosis of 50 microscopic slides during a three-hour period. This is a multiple-choice examination, the single correct answer for each question being based upon the correct diagnosis of the appropriate microscopic slide.

3. The diagnosis of photographs shown by projecting 25 to 50 slides on a screen (about one minute per slide).

4. The diagnosis of gross fixed specimens [note these are actual surgical specimens] and the answering of two multiple-choice questions about each. Rapid recognition is considered proportional to competence, and the time per specimen and its questions may be less than two minutes.

5. Cytopathology -- the diagnosis of 25 projected slides, illustrating material from the uterus, vagina, bronchus, urinary tract, gastrointestinal tract, serous cavities, and other areas. Multiple-choice questions will be asked regarding malignant changes, phase of menstrual cycle, existence of infestation or infection, various artifacts in the preparation, etc.

CLINICAL PATHOLOGY

1. A two and a half hour, multiple-choice, written examination on theory.

2. A practical examination in six parts:

   A. Medical chemistry -- a written examination on the basic theory and principles of medical chemical analyses, their practical application in the laboratory, and their clinical interpretation.

   B. Medical microscopy -- urinalysis, examination of spinal fluid, of semen, of duodenal and gastric material, of feces in problems of blood and pigments, and all other miscellaneous laboratory tests such as those for pregnancy and B.M.R. Diagnosis from projected slides.

   C. Hematology -- presentation of slides of bone marrow and peripheral blood for diagnosis.

   D. Immunohematology-blood banking -- written examination on practical aspects of immunohematology and blood banking, including transfusion problems, paternity problems, etc., as well as immunologic tests for

syphilis and other diseases.

E. Medical microbiology -- projected slides requiring diagnosis and interpretation of a variety of preparations such as bacterial colonies on various media, microscopic preparations, agglutinations, etc. of the type encountered in a laboratory for diagnostic microbiology.

F. Medical parasitology -- diagnosis of projected slides of 25 preparations of ova, larvae, or other forms of parasites (or parasitic diseases).

The examinations are offered twice a year, usually in May and November. Most candidates take both anatomic and clinical sections. The entire battery lasts three days. Tests are given at only one location each time, but sites are rotated around the country. The exams are proctored by pathologists.

Candidates are "Board eligible" for two three-year periods, and may take and re-take the tests twice a year during these two three-year periods -- theoretically, as many as twelve times. In November 1969, there were 338 candidates in anatomic pathology and 321 in clinical pathology.

The written questions consist not only of "completion" items, but also include "classification" items, "quantitative comparison" items, "correlation" items, "variation relations" items, "cause and effect" items, "chronologic comparison" items, and "multiple completion" items. Thus the written test format is more complex than is the case with most of the other written tests discussed in this report. A fuller description of the types of questions involved is found in Attachment 2 on Page 67 of this report.

The practical examinations were changed from performance tests to paper-and-pencil tests with slide presentations some years ago, because the increasing number of candidates made performance testing unwieldy.

To become eligible for the Board's examination, a candidate must meet a number of requirements. He must "possess moral and ethical standing in the medical profession." He must hold a license to practice medicine in the country in which he will reside. He must "devote professional time principally and primarily to pathology."

Furthermore, he must be a graduate of an AMA-approved medical school. (Graduates of acceptable foreign medical schools must be certified by the Educational Council for Foreign Medical Graduates.)

He must have in addition five years of training and experience, four of the five in institutions approved for residency training by the AMA, in which he has studied anatomic pathology and/or clinical pathology. But a medical school graduate who has not had such training and experience in a residency program may become Board-eligible after eleven years of other training or experience in the field of pathology.

PHS-SPONSORED EXAMINATION FOR CERTAIN DIRECTORS OF INDEPENDENT LABORATORIES

When Medicare regulations were drawn to allow laboratory directors without at least a bachelor's degree to qualify their laboratories to participate, the requirement was laid down that they must pass a Public Health Service-sponsored examination.

This test was therefore developed for PHS in 1966-67 under contract by the Professional Examination Service of the American Public Health Association, with the help of an advisory committee of nationally recognized authorities in the clinical laboratory field.

The test consists of (1) a general section covering organization, administration, records, facilities and equipment, safety, ethics, and quality control; and (2) specialty sections on microbiology, clinical chemistry, hematology, blood grouping and RH typing, and serology.

Laboratory directors lacking a bachelor's degree in a laboratory science plus at least six years of pertinent laboratory experience must pass the general section. In addition, each must pass the specialty section of the test for each specialty in which his laboratory performs tests and in which that laboratory does not have a Medicare-qualified supervisor. This latter provision applies also to directors with education and experience in one specialty who wish to qualify their laboratories in another specialty.

The examination is specifically aimed at testing the candidate's understanding of procedures performed, as opposed to purely theoretical considerations. Its questions are all multiple choice, primarily requiring recall of information, not exercise of judgment. A sample question and answer sheet, sent to all candidates, is Attachment 3 on page 72 of this report.

The general section of 84 questions takes $2\frac{1}{2}$ to 3 hours to complete. Each $1\frac{1}{2}$-hour specialty section has 60 questions, except for that on blood grouping and RH typing, which has 40. The tests have usually been administered by the state health departments, and occasionally by the Public Health Service regional offices.

The examination was first given in June 1967, and again in January 1968, December 1968, and December 1969, with makeup testing following each administration. Candidates may take the test up to three times, with no specific time lapse requirement.

Passing grades for each section, recommended by the advisory committee after the initial administration of the examination, are as follows:

General Section - 65%
Clinical Chemistry - 60%
Hematology - 60%
Microbiology - 55%
Blood Grouping and RH Typing - 55%
Serology - 55%

Of 474 non-degree directors examined up through the December 1968 administration of the test, 394 qualified their laboratories and 80 failed to qualify their laboratories (four of these for the third and final time).

Another 256 directors having degrees and pertinent experience in a particular specialty have taken portions of the test to qualify their laboratories in other specialties. No breakdown of these results is available.

LABORATORY "PROFICIENCY TESTING"

Laboratories -- not the individuals working in them -- undergo "proficiency testing" programs to assure quality control.

While such programs have been available to laboratories for years, they have now become mandatory under Medicare provisions and Federal interstate licensing regulations administered by the National Communicable Disease Center.

Such external quality control testing involves the mailing -- or hand carrying -- of samples, which the laboratory is to process in its regular manner along with the day's regular work. The laboratory reports its findings, and these are compared with results obtained by several reference laboratories and with other participant results in a number of different ways. The results are graded by comparing them with the "correct" answers, and evaluations are returned to the laboratory.

The College of American Pathologists offers (1) a quarterly basic laboratory survey series, designed for small laboratories, which it says "more than meets the proficiency test requirements for Medicare"; (2) a comprehensive series designed for large "sophisticated" laboratories, which "more than meets the proficiency test requirements for interstate licensure," including a series of tests in chemistry, a series in hematology-clinical microscopy, a series in blood banking, and a series in bacteriology-mycobacteriology-parasitology-mycology-serology; and (3) a special series designed as a teaching mechanism for residents and student technologists, limited to 500 participants, and including tests in bacteriology, mycology, parasitology, mycobacteriology, immunology, and serology.

Use of this College of American Pathologists comprehensive series program and certification by CAP after on-site inspection exempts a laboratory from licensing requirements of the National Communicable Disease Center.

The American Association of Bioanalysts, whose Proficiency Testing Service has been in existence for 20 years, offers programs "designed to fulfill the needs of laboratories of all sizes ranging from the one-man laboratory to the specialized laboratory to the fully automated laboratory." The service is designed "to meet governmental agency requirements." Semi-annual and quarterly surveys are provided, with tests in chemistry, hematology, blood banking, parasitology, and microbiology.

Many states use the services of these two proficiency testing programs. Some require laboratories to use any one of a number of state-accepted programs. Some have their own state programs. New York's three-year-old state-operated program, for instance, went to 430 clinical laboratories in 1967-68, and included mailed and hand-carried tests in bacteriology, mycobacteriology, mycology, serology, hematology, and clinical chemistry. Details of these tests are reported in the July 15, 1969 issue of the New York State Journal of Medicine, with the conclusion that the program has led to improvement in quality in laboratory work.

New York City's Bureau of Laboratories sends examiners who hand-carry samples and report on the testing procedures and other matters involving the laboratories' performance. Other health departments have, of course, other programs for on-site inspection of laboratory facilities and procedures.

Officials who administer the Medicare program reported in 1968:

To assure continuing good-quality services of independent laboratories once they are approved for coverage under Medicare, and with particular reference to those laboratory directors admitted under the grandfather clause, the National Communicable Disease Center has assisted the Division of Medical Care Administration to develop guidelines for a performance evaluation program. This evaluation will consist of three separate, though related, divisions -- proficiency testing, onsite inspection, and internal quality control. Beginning in July 1968, all states with non-doctoral-directed laboratories should have in operation a state-operated or approved proficiency testing program covering the full range of clinical laboratory specialties.*

Laboratories engaged in interstate commerce are required under the Clinical Laboratories Improvement Act of 1967 to be licensed by the Secretary of Health, Education, and Welfare through the National Communicable Disease Center, unless they are accredited by the College of American Pathologists and take part in its comprehensive proficiency testing program. The proficiency testing programs of only two states -- New York (excluding New York City) and Wisconsin -- have state-operated testing programs deemed sufficient to meet CDC standards. For inter-state laboratories in other states, CDC has set up its own proficiency testing service, sending out specimens in most of the clinical laboratory categories, such as chemistry, bacteriology, serology, hematology, and immunohematology.

The CDC program serves as a standard against which the states can measure their own proficiency testing services. In addition, many governmental laboratories and a few others not engaged in interstate commerce take the CDC program on a voluntary basis.

* Bierman, Pearl, Myers, Beverlee A., Rodak, John, and Reibel, Jay S., "Certifying Independent Laboratories Under Medicare," Public Health Reports, Vol. 83, No. 9, September 1968, Page 7390.

STATE LICENSURE EXAMINATIONS

The model laboratory licensure laws formulated by the Council of State Governments and by the National Communicable Disease Center both authorize state departments of health to conduct "written, oral, [and/or] practical examinations to determine the qualifications of clinical laboratory personnel for the purpose of licensure."

According to a CDC report on "Status of State Laboratory Legislation in the U.S.," and information gathered by mail and by telephone from a number of state departments of health, relatively few states (Alabama, California, Connecticut, Florida, Hawaii, Illinois, New Jersey, Pennsylvania, Tennessee), and New York City and Puerto Rico, have examinations for laboratory directors or subordinates in connection with licensing of laboratories or individuals.

Although New Jersey law authorizes written, oral and practical examinations for directors who are not State-licensed M.D.'s, the current tests are all written -- in fact, of the essay variety. The tests have sections on (1) chemistry, (2) bacteriology and parasitology, (3) clinical pathology and serology, and (4) hematology. Candidates must take all four. Each three-hour section is made up by a single examiner -- a pathologist -- and the essays in that section are graded by him before being reviewed by the New Jersey Board of Medical Examiners. Of the six or seven who take the examinations each time they are offered, all but one or two generally pass them. A candidate who fails one section may retake that section; if he fails more than one, he must retake the whole battery.

New Jersey also licenses public health laboratory technicians, with an examination in which the candidate may choose the test booklet for (1) bacteriology, (2) pathology, or (3) serology, with the warning that each has some general questions as well as the specific ones its title indicates.

The California State Board of Public Health issues clinical laboratory bioanalyst licenses to laboratory directors who meet educational and experience requirements and pass written, oral, and practical examinations. (Licensed physicians and surgeons may also direct clinical laboratories.) Written examinations are required of clinical laboratory technologists. For both sets of written examinations, California contracts with the Professional Examination Service of the American Public Health Association.

The technologists' examination is likened by W. Max Chapman, M.D., Chief of Laboratory Field Services for the California Department of Public Health, to the ASCP Registry exam. It has the same types of questions, and the same grading system -- a passing cut-off point one standard deviation below the mean. Some 1200 technologists took the test in 1969.

California's written test for directors who are bioanalysts is similar to that for technologists in asking both questions of recall and of judgment, but is of course more difficult. With it is given a three-hour practical prepared and graded by consultants at California universities or hospitals, and consisting of slides in parasitology and hematology for identification. These two tests are given twice a year, and those who pass both must also pass a one-hour oral consultation during which the candidate's technical knowledge and ability to apply that knowledge are assessed. About half of the candidates pass the written test, yet only 30% pass through all three phases of the examination to become licensed.

While Hawaii has tests for directors and for laboratory technicians (technologists), they are waived for a person of "good moral character" who has been similarly licensed by another state with similar standards, or who is ASCP-registered.

Individual laboratory workers are not licensed in Pennsylvania, but a laboratory applying for licensure must employ personnel who meet state standards. Tests may be given to assure that standards are met. Such tests are waived for ASCP-registered medical technologists. And veterans who have had 50 weeks of military laboratory training are accepted at the technician level without examination. For those who must be tested, the Division of Laboratories of the Department of Health treats each case individually, depending on the candidate's education and experience, and makes up an appropriate test.

The State of Illinois, while it does not license individual clinical laboratory personnel, does require these personnel to meet qualifications under the regulations for laboratory licensure.

Non-doctoral laboratory directors may be required to take a state-developed examination. Each one is individually set up, usually consisting of short-answer written questions. Such tests are also given technologists and technicians.

Illinois' requirement for supervising technologist is a minimum of two years of college including acceptable courses in chemical and biological science, a minimum of one year of supervised laboratory training and experience in an AMA-approved institution, and two years of additional laboratory work. Experience may be substituted for the first three years in the ratio of two years of supervised working experience for each year of collegiate and laboratory training. And one year of training and experience as an armed forces medical laboratory specialist may be substituted for the year of training in an AMA-approved program.

Tennessee requires examinations of non-doctoral laboratory directors, and of supervisors, technologists, and technicians. Candidates are offered an option of taking an over-all examination at each level, or tests in any of five specialties. If they elect the latter, their resulting license is of course limited to that specialty or specialties.

Examination questions were developed by an advisory committee to the Department of Public Health. The tests are then assembled by the Professional Examination Service of the A.P.H.A., which also provides the grading and statistical analyses.

The tests are offered twice a year. About 25% fail. A candidate may take the test at one level three times; if he fails each time, he may then take the examination for the level below.

There are no plans to offer oral or performance tests.

The Tennessee regulations are unusual in that they spell out the training for technologists and technicians in great detail. While the usual training for technicians is a full year of didactic and clinical work, the regulations offer an alternate route to eligibility for the licensing examination -- through training and service as a military medical laboratory specialist at the journeyman level.

Florida's new law calls for licensing of medical laboratory personnel at four levels -- director, supervisor, technologist, and technician. And for all but the technician, licensing in six specialties is offered. Some 4,500 people were "grandfathered" in under the new law, but now every candidate for licensure must take an examination. Thus the State Department of Health has a total of 19 new examinations.

The examinations, all written, were developed by the Professional Examination Service of the A.P.H.A. There are no plans for oral or performance testing.

For the three upper levels, there are 50 questions on each specialty examination. Most people take more than one. The supervisor's and the director's examinations include an additional 30-50 questions on administrative matters.

The technician's examination is one over-all unit containing 100 questions.

About 500 persons took the examinations on their first administration in May 1969 -- about 40% of them technicians. They were to be given again in December 1969, and thereafter at least semi-annually.

New York City's regulations offer two routes for technical personnel in laboratories to achieve certification. Certificates of qualification may be obtained without examination by those who have the required education and experience. Those who do not must take written, oral, and practical examinations.

For laboratory directors, the written examination is prepared by the Advisory Committees on Clinical Laboratories and Blood Banks. The examination, of the essay variety, is a very comprehensive one, taking at least four hours to complete. It requires exercise of judgment as well as recall of information.

A director who passes the written examination is eligible for the oral/practical examination. This half-day test takes place in the facilities of the Bureau of Laboratories. Each director is examined by three competent specialists in his own field. Other than a general list of areas to cover, they have no pre-set instructions as to how to proceed with the examination. They know nothing of the candidate, and have not seen his essay test. At the end of the practical, after discussion among themselves, the examiners must write their critical comments, generally aimed at answering the question: "Would you leave this candidate in charge of your own laboratory?" Two of the three must agree for him to receive certification.

For candidates on the lower levels in the laboratory, New York City uses the written examinations of the Professional Examination Service of the A.P.H.A., supplementing them with its own oral/practical tests. For laboratory supervisors, the oral/practical takes two hours and involves two examiners (who must agree, or a third is called in). For technologists and for technicians, one hour and one examiner apiece are required. Each candidate on these levels is given one problem -- of varying complexity, of course, according to the level of the applicant -- to work out in the presence of the examiner(s). These problems are structured in advance, unlike those presented the laboratory directors.

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For technologists, the Medicare regulations require completion of one of the following: (1) a course of study leading to a bachelor's degree in medical technology, (2) three academic years of study and a year of training in an AMA-approved school of medical technology, (3) a course of study meeting requirements for a B.S. in one of the chemical, physical or biological sciences, plus at least one year of pertinent laboratory experience and/or training, or (4) three academic years of study with specified chemistry and biology courses, plus at least one year of laboratory experience or training. These last two options must have provided the individual with education and training in medical technology equivalent to that described in the first two options.

The standards for technicians require high school graduation plus one of the following: (1) a one-year AMA-approved technician training program, (2) two years of experience in an acceptable clinical laboratory, or (3) a 50-week course

CIVIL SERVICE EXAMINATIONS

The medical laboratory workers in the field of public health are not tested for proficiency if they work for the Federal government, but are likely to have undergone such testing if they work for a state.

The only U.S. Civil Service testing of laboratory personnel is that of GS-2 and GS-3 Medical Laboratory Aides, who "must pass a written test of abilities necessary to learn and perform the duties of these positions"--in other words, an aptitude or predictive test, not a test of knowledge or achievement.

Most of the state and local civil service regulations, on the other hand, do require at least written examinations of individuals seeking to work in state clinical laboratories. Nearly half the states operate their examination programs under contracts with the Professional Examination Service of the American Public Health Association, as do major cities and counties such as Berkeley, Baltimore City and Baltimore County, Detroit and Wayne County in Michigan, and Philadelphia and Allegheny County, Pennsylvania. These are broad contracts covering the more than 25 fields in which PES provides tests.

PES examinations are composed of multiple-choice written questions drawn from its huge bank of test questions developed and reviewed by specialist consultants. They are practice-oriented, "aimed at the real world," and not specifically related to academic courses or to training programs.

PES points out the difference between these employment tests and the licensing tests they also prepare: while the licensing examinations are designed to eliminate the worst, the employment examinations aim at identifying the best practitioners in any field.

In Illinois, which makes up its own civil service tests, the written examinations for laboratory technicians are supplemented by practical examinations which the State Department of Personnel developed to weed out candidates who in fact are unfamiliar with laboratory procedures even though they may understand them on paper. Before, many had passed the written examination "who didn't know what the inside of a laboratory locked like."

The Illinois regulations now call for each candidate for Laboratory Technician I and II (Option 1--Clinical) to take a written examination covering arithmetic, vocabulary, laboratory equipment, laboratory techniques, and clinical tests and procedures. On passing that, he must take the performance test, which, the regulations state, "includes a practical demonstration in a State laboratory of the candidate's ability to perform specific laboratory tasks and tests his knowledge of the equipment and techniques used....The performance test also includes an evaluation of the candidate's personal qualities and general aptitude for laboratory work...." Similar tests exist for Option 3 - Histological and Option 8 - Bacteriological, as well as for other options not related to this study.

To becomeeligible for employment at the stated grades, the technician must make a score of at least 70 on each test. And for the over-all assessment of the candidate, the written test is weighted at 70%, the performance test at 30% for the Laboratory Technician I, and the written test at 60% and the performance test at 40% for Laboratory Technician II.

Members of the interviewing board for the practical tests receive suggested questions and problems, and some information about how to rate the candidates being interviewed. The test takes a minimum of 20 minutes, and includes oral questions concerning laboratory procedures, identification of laboratory equipment, and performance of a simple laboratory procedure such as a blood count. Examiners may also ask questions designed to determine what they would do in the event of unusual test results.

Ratings are made in four categories: personal qualities, job knowledge, practical application, and overall evaluation. Instructions and rating sheets for performance test examiners form Attachment 4 on page 73 of this report.

Some 15-20% of those who pass the written tests fail the performance test. Here are pass-fail figures on the candidates of the last three years:

	Failed Written Test	Failed Perf. Test	Passed Total Exam
Lab. Tech. I			
1967	31	8	34
1968	42	8	53
1969 (to Oct. 14)	26	4	31
	99	20	118
Lab. Tech. II			
1967	9	9	37
1968	27	9	26
1969 (to Oct. 14)	11	2	11
	47	20	74

The State of California also devises its own examinations, including a series in the laboratory field.

For most levels in the laboratory, tests consist of written and oral portions, weighted about 60% add 40%, respectively, in the over-all score. The objective multiple-choice written tests involved are aimed at ability to apply principles and analyze data, as well as to recall information. Questions on supervision appear in tests on the higher levels.

A recent addition to California's testing program for laboratory personnel is a performance test for the Laboratory Assistant I level, developed in response to the needs of people who were having trouble with the verbal content of the former written test (which it replaces, not supplements). The new test is to be given first in February 1970. It will consist of three sections: (1) identifying laboratory equipment by matching items and name cards, (2) reading charts regarding the decontamination of equipment and (3) segregating laboratory items in two ways--first, distinguishing among items as to how they must be sterilized, and second, distinguishing among usable glassware and that which may be damaged or dirty. Examiners will be given thorough orientation, as they are for all performance tests developed by the California State Personnel Board, to provide for the maximum possible objectivity. Candidates who pass the performance test will also be given an oral interview, to evaluate personal qualifications, as the second part of the examination. Each part is weighted 50%.

There are no plans to use performance testing above this entry level position.

California has a Mechanical and Technicial Occupational Trainee classification particularly designed for the training of people who do not meet the formal entry level requirements. Completion of this training--or of any other "formalized laboratory work experience and training program of at least three months' duration, such as those conducted under Manpower Development and Training Act, Work Incentive Program, or similar work experience programs conducted by State Agencies"--makes the trainee eligible for the new Laboratory Assistant I examination.

From the Assistant level, additional years of experience in the State service make an employee eligible for advancement up to the Technician level, where formal education begins to be required.

Civil service regulations, Federal and state, generally do not provide for the mobility of laboratory personnel from the technician level, requiring some training and experience post high school, to the professional technologist level, requiring essentially college graduation.

No equivalency procedures are indicated for bridging this gap either in present regulations or in drafts such as (1) the "Guide Class Specifications for State Public Health Laboratories." prepared recently by the HEW Office of State Merit Systems, the Association of State and Territorial Public Health Laboratory Directors, and the National Communicable Disease Center, or (2) "Educational Qualifications of Public Health Laboratory Workers," prepared in 1966 by the Committee on Professional Education of the American Public Health Association and published in the March 1967 American Journal of Public Health.

It was understood by those preparing the above-mentioned drafts that technician-level personnel may do routine work under supervision, but that judgment is required for the professional level technologist--judgment that is presumably formed on the basis of the theoretical knowledge gained with a college degree.

Nonetheless, state laboratory officials and others concede there are certain individuals who can and do add to their own stores of knowledge--practical and theoretical--without setting foot in a classroom. Most laboratory directors queried know of several cases where laboratory workers have exerted that extra effort, and where it was recognized by making a special exception to the usual rules.

ETS-CSC TESTS OF VA MEDICAL LABORATORY TECHNICIANS

A full battery of tests and ratings were given to medical technicians at Veterans' Administration hospitals in 1967 and 1968, as part of a large study on test and job performance of Negroes and whites.

The study, undertaken jointly by the U.S. Civil Service Commission and the Educational Testing Service under a Ford Foundation grant, aimed "to identify tests which are good predictors of job performance and at the same time do not place certain cultural subgroups at an unfair disadvantage."

The medical technician's job happened to be chosen as the first one to be studied, partly because there are both whites and blacks working on the same levels, because their tasks are highly visible, and because most were hired without testing and therefore the group was not test-selected in advance of the study.

Data were collected for 297 white technicians and 168 Negro technicians working in some 30 VA hospitals across the country. Each had been on the job at least two years; the median was eight to ten years. The data included scores on a battery of nine aptitude ("predictor") tests, a questionnaire giving background information, ratings by supervisors and co-workers, scores on a test of job knowledge, and results of a one-hour work sample.

The aptitude battery was chosen from a group of Educational Testing Service and Civil Service Commission instruments, each of which is known to assess certain cognitive abilities. Only predictor variables throught to be related to the job activities of the medical technicians were used--aptitude tests such as might be given before employing people for these jobs. These were number facility, clerical speed and accuracy, certain perceptual skills, mechanical aptitude, fine finger dexterity, verbal aptitude, and short-term memory.

The questionnaire included amount of experience, amount of education, family socio-economic status, and areas of laboratory experience.

Rating scales completed where possible by co-workers and by two levels of supervisors, were designed to measure flexibility, organization, job interest, learning ability, job knowledge, dexterity (or "technique"), need for supervision, communication skills, and over-all ability. The rating scales were developed with care and contained extensive instructions to the raters. Each rater was asked to rate all the technicians in his laboratory on one aspect of job performance before going on to rate each on the next aspect. Descriptions of job performance on the scales defined the levels of the scale in several styles, allowing for difference in style on the part of the raters. In addition, a fictitious "Otto Analyzer" was to be rated on each scale to provide a basis for judging the sevérity of the rater.

The study aimed at minimizing the usual problems involved with rating scales, such as: (1) "halo" effect, the tendency to allow a general liking or disliking color individual ratings on specific tasks; (2) a tendency toward the mean, rating everyone average; (3) lack of validity of the scale itself, when characteristics being rated have little or nothing to do with the likelihood of successful job performance; and, most important, (4) rater bias, which occurs when the supervisors inexperienced at rating behavior have no guidelines except their own experience, and may tend to rate people working in their own specialties more harshly, or may tend to use different criteria in rating men and women, or may have any one of a number of other possible biases.

Some evidence of rater bias came through in this study, according to a representative of ETS, despite the efforts to make the scale objective. Comparing ratings with the job knowledge test showed high correlations for black supervisor/black technician, for white supervisor/white technician, and for white supervisor/black technician. But the black supervisor/white technician combination's very low correlation seemed to indicate personality characteristics were interfering with the ratings for this group.

The rating scale was used as a criterion of job performance against which to measure the predictive test results.

The job knowledge test was assembled from items used in tests in a hospital medical technology school, reviewed and updated. The 75 multiple choice questions were aimed at testing recall of knowledge used on the job. The test was used as a second criterion for comparison with the aptitude tests.

The third criterion was to have been a one-hour work sample. This portion of the test battery was administered to 42 technicians at three hospitals. An alkaline phosphatase determination composed of three independent measures was required, as was a leukocyte differential blood count. But the various problems that developed with the work sample test made it of little value in the over-all project.

Among the problems was the fact that the testing was done in working laboratories, where work space was limited and the borrowed equipment left much to be desired because it was only that equipment not needed for patient care; it was not of highest quality, and it varied from one lab to another. In addition, the tasks chosen for the work sample proved to be too difficult for the technicians being tested. More than 42 technicians would have been tested, but the work sample procedures were discontinued when these difficulties, and others, developed. All the data obtained were analyzed, but no significant correlations could be found with the other measures in the study.

While this particular work sample proved abortive, ETS experts believe it is possible to devise another set of procedures which would prevent the various problems which arose with this test.

In an interim report of the study's results, ETC and CSC officials pointed out that the comparison of the job knowledge test with aptitude tests showed the opposite of what might be expected: comparison of the aptitude tests with the criterion measures (the job knowledge test and the ratings) did not show that paper and pencil tests are unfair to Negroes. On the contrary, there were higher validities for whites shown on the presumably culture-free aptitude tests (such as dexterity), while presumably culture-bound tests having to do with vocabulary actually predicted job performance better for Negroes. Generally, whites who scored any specific score on prediction tests could be expected to do better on the job knowledge tests than Negroes scoring the same number. No explanations for these results have been advanced.

ETS and CSC are analyzing the data further, and are expanding their study to other job positions.

AIR FORCE TESTING

The United States Air Force testing program includes several tests for military medical laboratory personnel.

The more than 500 Air Force tests have been developed under policy guidelines laid down by the Personnel Standards Division, Directorate of Personnel Planning, Deputy Chief of Staff for Personnel, Headquarters, USAF. They are administered by test control officers at Air Force installations throughout the world.

Among about 50 tests given in medical fields are examinations for Medical Laboratory Specialist and Medical Laboratory Technician.

Until Spring, 1969, these tests were used to advance military laboratory personnel from one skill level to another. Beginning in the Fall of 1969, they are being used for grade promotions to Grades E-4 through E-7 instead.

A Medical Laboratory Specialist (90430) has usually had the Air Force basic medical laboratory course, although some personnel receive their training on the job. After experience, he may be promoted to Medical Laboratory Specialist (90450) level. He may then take the advanced medical laboratory course, providing fourteen weeks of didactic training and nine months of clinical training. This course is desireable but not mandatory for the Medical Laboratory Technician (90470) level. Other specialties are Medical Laboratory Superintendent (90491) and Histopathology Technician (90471).

Each Air Force test is administered once a year to those who qualify for grade promotions through length of service in theAir Force and in the specialty involved. All are scored using the percentile system; the higher the score, the more points the airman gets toward his weighted Airman promotion System score. Those who are not promoted may take the test again the following year. There is no experience to date with the new use of the tests that would provide useful information on pass-fail rates.

The two laboratory tests examined for this study were designed for 90450 and 90470 level personnel. They have been modified for promotion use, excluding some "management" questions which are covered in another promotion examination, and covering only content related to the medical laboratory field at the particular grade involved.

Each test now consists of 115 multiple-choice items. They are designed to test the application of principles in actual job situations. They were developed by Air Force senior non-commissioned officers who are on the job in medical laboratories, with the assistance of test psychologists in editing questions.

The Air Force also offers Career Development Courses by correspondence. Laboratory personnel who do not take the full medical laboratory course are required to take available correspondence courses at the same time they are developing on-the-job skills. New courses are being prepared in chemistry and urinalysis (#90411), microbiology (#90412), hematology, serology, blood banking and immunohematology (#90413), and medical laboratory administration (#90414). Evaluation portions of these courses are not fully developed, but should be the subject of research for any future study of testing applicable to medical laboratory personnel.

ARMY TESTING

The U.S. Army's Enlisted Evaluation System provides the basis for all personnel management decisions involving an Army enlisted man -- including promotion, superior performance pay, and choice duty locations.

The tests are developed by the U.S. Army Enlisted Evaluation Center at Fort Benjamin Harrison in Indianapolis. Policy guidelines are laid down in Washington by the Classification and Evaluation Branch of the Enlisted Personnel Directorate of the Office of Personnel Operations.

The evaluation tests are developed "to insure maximum coverage of your job requirements," according to the Test Aid put out by Army headquarters to list reference materials and courses for pre-test study. Tests are given each year.

Pass-fail rates, expressed in percentages, not as an absolute passing score, are determined by consultation with the professional groups in related civilian fields. The medical specialties have the highest rates for failure -- about 10-12%. A corpsman who fails is considered for reclassification to another specialty, and may be required to do additional study. Reclassification is mandatory for failure the following year. Anyone who fails evaluation tests three successive times regardless of the specialties involved must be considered for elimination from the service.

There are three skill levels for Army medical laboratory personnel, with a test for each:

MOS code 92B20 - Medical Laboratory Assistant or Specialist
MOS code 92B30 - Senior Medical Laboratory Specialist -- must have successfully completed the Medical Laboratory Procedures (Advanced) Course or be an ASCP-registered medical technologist
MOS code 92B40 - Chief Medical Laboratory NCO -- a supervisory position

Each of the tests contains 125 multiple choice written questions. There are no performance tests in the medical field in the Army. The tests are designed to present problem situations such as those the individual would meet on the job. The Evaluation Center aims to get away test items which ask for isolated bits of information.

AMERICAN MEDICAL TECHNOLOGISTS PROFICIENCY TESTING PROGRAM

In May 1969, the American Medical Technologists announced its A.M.T. Educational Performance Proficiency Program, constructed for A.M.T. by the Illinois Association of Clinical Laboratories.

The A.M.T. is an accrediting group not sponsored by or affiliated with any organized medical group nor recognized by the National Commission on Accrediting. The I.A.C.L. has been an independent group, but will become in January 1970 a state section of the American Association of Bioanalysts, a national professional organization of independent clinical laboratory owners.

The new Educational Performance Proficiency Testing Program was instituted because:

Existing proficiency testing programs do not encompass all laboratory personnel;
The need for involving all laboratory personnel in programs of continuing education is apparent;
We are aware that good laboratory work is the result of all laboratory personnel having access to, and being able to participate in, a variety of programs of continuing education.

The program is designed for laboratory personnel who wish to participate voluntarily as individuals in the type of proficiency testing required of laboratories. It can also be used as a work home study program for those who cannot get to continuing education seminars, and by those not currently employed in laboratories who wish to keep up to date. It uses a reference manual developed by the I.A.C.L. for participants in its laboratory proficiency testing program.

Materials in four laboratory specialties became available in the Fall of 1969, as described in the announcement:

HEMATOLOGY -- This will include some urinalysis and general testing procedures.

- the hemoglobin determination
- blood specimens for various examinations such as reticulocytes, eosinophiles, red cell morphology, L.E. cells, etc.
- Kodachrome slides of normal, atypical, and abnormal blood cells
- vials for erythrocyte and leukocyte enumeration and work sheets for calculation of indices
- Kodachrome slides of cellular constituents in urinalysis, observation and work problems
- general laboratory observations and work problems, including specimens

MICROBIOLOGY

- Bacteriological specimens, work slides, and work problems
- Parasitology -- work specimens and instruction sheets
- Mycology -- work specimens and instruction sheets

CHEMISTRY

- Basic testing series for laboratories
- Experiments in methodology with samples and reagents
- Work problems in chemistry

CYTOLOGY

- Slides and work instructions
- Kodachrome slides of unusual as well as normal and abnormal cells

SUGGESTIONS FOR EVALUATION OF RETRAINED MEDICAL TECHNOLOGISTS

In connection with a report on "Retraining Medical Technologists," prepared by the National Committee on Careers in Medical Technology under contract with the Public Health Service, and published in May 1967, consideration was given to the problems of evaluating retrainees.

Although it was decided not to include evaluation procedures in the resulting "Curriculum Guides" because of the great variation in the backgrounds of the people who would receive that training, the possible ways of testing medical laboratory personnel were discussed in some detail in the contract report.

Three types of skills need to be examined, according to the report: "retention of factual knowledge, laboratory proficiency in applying that knowledge, and laboratory discipline essential to mainenance of quality of technical skill."

Knowledge tests are best administered by the subject matter instructor, the report said. It went on to point out that there is no standard procedure for the evaluation of laboratory discipline, and that therefore ratings by supervisors must continue to be subjective judgments.

On the matter of laboratory proficiency, however, the report went into more detail, and in fact drafted part of a "programmed test" in bacteriology as a sample of the type of testing which could be done.

The suggested test is adapted from procedures used by the National Board of Medical Examiners which will be found in a subsequent section of this present study. According to the retraining evaluation report:

> The primary goal then is an instrument suitable for evaluating laboratory proficiency that can be universalized for purposes of design and measurement. This might be accomplished by creating a mock clinical situation in which the examinee is confronted in laboratory practice. The test instrument would then examine the judgment and ability exercised by the examinee in aligning the variables in proper perspective and in pursuing avenues of selection and decision leading to successful determinations. Ideally, the test instrument would be "programmed": that is, constructed in sections so that information gleaned from choices made in one part would contribute to the selection of alternatives in a subsequent part. It should also be amenable to audit and correction by the examinee at any point in the working of a particular problem, to the extent that correction of procedure is possible during the course of a laboratory determination.
>
> Attachment C shows a programmed problem set designed to assess laboratory proficiency in bacteriology. It simulates a laboratory situation in which the correct selection of alternatives depends on the examinee's judgment in using the factual knowledge at his command.
>
> The set is composed of three related problems, each posing alternative courses of action. Some courses of action will be correct choices, some incorrect, and some will neither contribute to nor impede the examinee's progress. Each possible course of action is accompanied by

two erasable blocks. (Special erasable ink would be necessary in laying these blocks over the printed answers). When the left block is erased, the result of the action selected is disclosed. The information disclosed under the erased blocks is used to enter the second problem in the set, where alternatives are again selected on the basis both of this information and additional given information. At the conclusion of the entire problem set, the right hand blocks are erased to disclose the answer key. The examinee is scored according to the "yes", "no" or "optional" beneath the right block accompanying each choice. After scoring in each problem set, the examinee may erase all blocks to see the results of the choices not selected.

Other types of instruments may also be used to measure laboratory proficiency: for example, a group of reproductions (photographs and drawings) and graphs depicting a technologist's observations in a clinical situation, preferably a borderline or multiple condition rather than a single "classic" one.

The suggested "programmed" test and the suggested rating scale form

Attachment 5 on page 78 of this report.

THE AMERICAN ACADEMY OF MICROBIOLOGY EXAMINATIONS

A number of certificates are available to professionals in the field of microbiology from agencies of the American Academy of Microbiology. The National Registry of Microbiologists offers examinations for Registered Microbiologists at the baccalaureate level, and for master's and doctoral degree Specialists in Public Health and Medical Laboratory Microbiology. The American Board of Medical Microbiology offers certification at the post-doctoral level in Public Health and Medical Laboratory Microbiology and five separate specialty areas. While none of the three examinations aims at testing on-the-job competence of laboratory personnel, information about them is included here because of the importance of microbiologists in clinical laboratories.

Candidates for Registered Microbiologists must have a baccalaureate degree with major specialization in a biological science and certain specified science courses. The Standards and Examinations Committee of the National Registry may admit to examination persons who lack some of the course requirements.

The examination provides "concrete evidence that the candidate is familiar with the concepts, information, and factual knowledge appropriate to this field," according to the Registry's announcement, "but it does not provide for appraisal of laboratory competence."

Each candidate must pass a general written examination and two of the following written specialty examinations: (1) agricultural and industrial microbiology, (2) food, dairy and sanitation microbiology, (3) pathogenic bacteriology, (4) immunology and serology, (5) virology, (6) mycology, and (7) parasitology. All are multiple-choice tests.

The examinations are given in the office of a Fellow of the Academy near the candidate's home, and at a time convenient to the candidate.

A candidate may repeat sections failed, or the entire examination, any number of times.

The Specialist program, established in June 1969, is designed to recognize master's or doctoral level individuals who have a capacity to supervise the operation of the microbiological procedures in a public health or medical laboratory. As with the Registry program, the intent is to provide recognition for training and scientific understanding, but not an appraisal of laboratory competence. To be eligible, an individual must have a master's degree in microbiology or a master's or doctorate in medicine or science, plus at least four years of acceptable experience. And as above, the committee may admit to the examination persons who do not have the specific course requirements, if it judges they are nevertheless otherwise qualified "by virtue of long and effective experience in microbiology." There is no waiver of the required degrees under this provision in either case, but only of specific courses.

The examination is a comprehensive written test in public health and medical microbiology. There are no options. It is given at a time and place convenient to the candidate. And it may be repeated, six months after the date of notification of failure, any number of times.

Until June 30, 1974, an applicant may be registered as a Specialist without examination if he meets the requirements for admission to the examination. And the master's or doctoral degree requirement will be waived until that date "for persons with established positions and eminence and who are members of the National Registry of Microbiologists with seven years or more of experience, ... and are serving as a supervisor or its equivalent at the time of application."

To be eligible for certification as a Diplomate of the American Board of Microbiology, a candidate must have an earned doctoral degree and five years of pertinent and acceptable post-doctoral training and experience. One year of teaching of independent research and one year of clinical internship or residency may be substituted for one year of experience.

In addition to the broad certification in Public Health and Medical Laboratory Microbiology, certification is available in the specialties of bacteriology, immunology, mycology, parasitology, and virology.

The examination has two parts. Part I is a three-hour written, multiple-choice test of 180 questions covering all the specialties. It tests a minimum knowledge level in each specialty considered to be necessary for anyone certified by the Board. The questions "are limited to basic knowledge and applications of it; specific details of sophisticated procedures and newer aspects of molecular biology are excluded." An over-all grade of 75 is passing.

Part II is a more advanced test on the candidate's selected area of competence. It consists of written and oral portions, both administered by the same three examiners.

The examination may be repeated any number of times, after six months.

NATIONAL REGISTRY IN CLINICAL CHEMISTRY EXAMINATIONS

A new organization which has just conducted its first testing program, the National Registry in Clinical Chemistry was recently formed by the five major chemical organizations in the United States having a direct interest in the field of clinical chemistry: The American Association of Clinical Chemists, the American Board of Clinical Chemistry, the American Chemical Society, the American Institute of Chemists, and the American Society of Biological Chemists.

The Registry grants accreditation at two levels: Clinical Chemistry Technologist and Clinical Chemist.

The Clinical Chemistry Technologist level is "designed primarily for applicants with recent bachelor's or master's degrees in chemistry or for those with academic degrees in other disciplines who regularly perform clinical chemistry determinations." To be eligible for the examination, a candidate must have a bachelor's degree in chemical science or a "closely related discipline," including at least 16 semester hours of chemistry, and at least one year of acceptable experience in clinical chemistry after the baccalaureate degree.

The Clinical Chemist category "exists for more experienced graduates who have majored in chemical science and who are active in the field of clinical chemistry." A baccalaureate degree with a minimum of 32 hours in chemistry is required, and at least six years' subsequent experience. A master's degree may be substituted for two of the years of experience, and an earned doctorate, for four.

In an interesting variation for a grandfather clause, until the end of 1970 candidates who are otherwise eligible need have had only 16 semester hours of chemistry if the number of years of experience in excess of six when added to the number of semester hours in chemistry totals at least 32.

The Registry's first examination, administered on October 31, 1969, to 113 candidates, was prepared by the Professional Examination Service of the American Public Health Association. It is a three-hour, 150-item, multiple choice written test designed to evaluate knowledge of both the fundamental and practical aspects of clinical chemistry. Its three principal parts are basic science, laboratory practice, and methodology. It will be given again in the Spring of 1970. Candidates who fail may appeal to the Registry's Board of Directors within 60 days, or apply within one year for re-examination.

AN EQUIVALENCY TEST FOR MEDICAL LABORATORY TECHNICIANS?

The principles of equivalency and the need for equivalency examinations are built into the new criteria for certification of Medical Laboratory Technicians -- MLT(ASCP). The criteria, developed by an ad hoc committee of the American Society of Clinical Pathologists (ASCP), composed of pathologists and medical technologists, were later approved by the ASCP Board of Directors. They are subject to further revision and refinement, particularly in the working out of mechanics of a two-year equivalency examination.

There are spelled out in the criteria several routes to becoming eligible to take the newly-established Registry examination for medical laboratory technicians -- essentially equivalent to a two-year associate arts degree with clinical training included or added. The routes are these:

I. Individuals with an associate degree from an institution having a clinical affiliation with a laboratory approved by the Board of Schools of the ASCP are eligible providing:
   A. They possess an associate degree granted by an accredited institution. The curriculum leading to this degree may be one of the following:
      1. A structured program in medical laboratory sciences.
      2. A program that includes courses in chemistry and biology.
      3. An experimental program acceptable to the Board of Schools of the ASCP.
   B. An adequate period of supervised clinical experience in a physician-directed laboratory approved by the Board of Schools of ASCP. This period may be part of or follow the degree program, and may be implemented in a number of ways relative to the educational needs of the institution.

II. Individuals who are presently Certified Laboratory Assistants:
   A. Will be eligible for examination providing:
      1. They possess or acquire an associate degree, or
      2. They demonstrate comparable academic standing as measured by a two-year college equivalency examination.
   B. Certified Laboratory Assistants, who as of July 1, 1969, possess an associate degree or have 60 semester hours or 90 quarter hours of college credit may upon application be classified as a Medical Laboratory Technician without examination.

III. Graduates of military medical laboratory programs totalling no less than twelve months duration will be eligible for examination as a Medical Laboratory Technician by fulfilling one of the following requirements:
   A. Possess or acquire an associate degree, or
   B. Demonstrate comparable academic standing as measured by a two-year college equivalency examination.

IV. Individuals with an associate degree but lacking supervised clinical experience in a physician-directed laboratory approved by the ASCP Board of Schools may become eligible for examination as a Medical Laboratory Technician if:
   A. They possess an associate degree or establish equivalent academic standing and:
      1. Have had a twelve months structured curriculum in medical laboratory techniques, which may have been

2. One year of experience in a physician-directed laboratory acceptable to the ASCP Board of Schools.

B. They hold an associate degree plus five years of experience in a physician-directed laboratory acceptable to the ASCP Board of Schools.

The first Registry examination for this new level was given on November 14, 1969. This administration was aimed particularly at graduates of military laboratory programs (see III above), and was publicized through the Surgeon Generals' offices of the services.

To pursue the possibility of developing equivalency examinations which would be acceptable for credit by institutions offering two-year medical laboratory technician courses, the National Committee for Careers in Medical Technology initiated discussions with officials of the College-Level Examination Program of the College Entrance Examination, which offers examinations used by college to grant credit for off-campus academic learning. (See the section of this report starting on page 49 for a full explanation of the CLEP program).

On November 24, 1969, a meeting was held in New York, at the invitation of CLEP, to discuss the feasibility of devising equivalency tests for the medical laboratory field.

Those present were:

Harold G. Levine, Director of Education, American Society of Medical Technologists, Houston, Texas

Mrs. Jean Linehan, National Council on Medical Technology Education, Bethesda, Maryland

A. Wendell Musser, M.D., Director of Allied Health Education, Duke University, Durham, North Carolina, and Chairman, National Council on Medical Technology Education

John R. Noak, Director, Department of Educational Research, Office of the Superintendent of Public Instruction, State of Illinois, Springfield, Illinois, and consultant to the Board of Registry of Medical Technologists.

Thomas M. Peery, M.D., Chairman, Department of Pathology, George Washington University Medical Center, Washington, D.C., and immediate past-president, American Society of Clinical Pathologists

Professor Robert L. Love, Division of Health Technologies, State University of New York, Alfred, New York, and Chairman, Council on Associate Degree and Certificate Programs, Association of Schools of Allied Health Professions

Mrs. Barbara Pryor, National Council on Medical Technology Education, Bethesda, Maryland

George P. Vennart, M.D., Professor and Chairman, Division of Clinical Pathology and Hospital Laboratories, Medical College of Virginia, Richmond, Virginia, and Chairman, Board of Registry of Medical Technologists, American Society of Clinical Pathologists

Nathaniel C. Allyn, Associate Director, Council on College-Level Examinations, College Entrance Examination Board, New York, New York

Jack N. Arbolino, Executive Director, Council on College-Level Examinations, College Entrance Examination Board, New York, New York

Ernest Kimmel, Assistant Program Director, College-Level Examination Program, Educational Testing Service, Princeton, New Jersey

John R. Valley, Senior Program Director, College-Level Examinations, Educational Testing Service, Princeton, New Jersey

There was general agreement that:

* Equivalency tests are needed in the medical laboratory field. Eventually, the aim would be to offer mobility from the bottom to the top of the career ladder.

* The immediate need is for equivalency tests applicable to the Medical Laboratory Technician (MLT) level in the laboratory. Such tests would be useful to those working on lower levels in the laboratory, and to military medical corpsmen wishing to enter the civilian health field. There has been increasing pressure from governmental sources on the latter, and increasing interest from the health occupations in this pool of manpower. Equivalency tests to enable these and other technicians to move upward should also be considered.

* It is important to offer both professional recognition and academic credit. Thus the Registry could continue to offer its MLT examination for the former. And a battery of tests for academic equivalency should be developed for junior college credit.

* CLEP, with its academic acceptance, is the ideal agency to provide test for academic equivalency.

* It is inevitable that there will be some time and credit lost in any program offering vertical mobility. We should not be dissuaded from attempting examinations by the fact that all credits given for them by junior colleges may not be transferable to four-year programs.

* What is needed is a battery of tests which will measure learning -- both theoretical and practical. A measure of performance must be included -- possibly a set of guidelines to be administered by the local institutions.

It was agreed that at least these three groups in the field need to be involved in the development of equivalency examinations: the medical technologists, the pathologists, and the colleges.

The medical technologists, represented by the American Society of Medical Technologists (ASMT), and the pathologists, represented by the American Society of Clinical Pathologists (ASCP), are both also represented by the National Committee for Careers in Medical Technology (NCCMT). The junior colleges are represented by the Council on Associate Degree and Certificate Programs of the Association of Schools of Allied Health Professions (ASAHP) and by the American Association of Junior Colleges (AAJC). The four-year institutions are represented by the Council on Baccalaureate and Higher Degree Programs of the ASAHP.

For the time being, NCCMT will provide the coordination and staff work for the above group of associations. Official representation from the organizations will be sought. The next step is a formal request from these groups to CLEP. And later there may be a joint search for some outside financial support.

TESTS IN OTHER HEALTH FIELDS

NATIONAL BOARD OF MEDICAL EXAMINERS EXAMINATIONS

This and the sections which follow deal with testing in other health fields. Much can be learned from these programs which can be adapted to the testing of medical laboratory personnel.

The National Board of Medical Examiners examinations are divided into three parts: Part I, the preclinical sciences; Part II, the clinical sciences; and Part III, clinical competence.

The first two parts, taken in medical school, consist of multiple-choice questions, and, according to officials of the Board, have "been well established as highly reliable tests of medical knowledge and a candidate's ability to apply his knowledge to the problem in hand."*

Until 1961, the clinical competence evaluation -- Part III -- was an oral examination by the bedsides of assigned patients, with examiners looking on. To eliminate the problems presented by the patient and the examiner as variables, the National Board devised a new Part III examination designed "to obtain a reliable measurement of the third variable, the candidate."

Since the candidate has not only completed medical school but also his internship when he takes this portion of the test, the aim is to test not only didactic learning but also the application of that learning in practice.

With the help of the American Institute for Research, a realistic definition of clinical competence was obtained by the "critical incident technique" developed by Dr. John C. Flanagan. (For information about this technique, see the bibliography of this report.) Then an examination was developed which since 1961 has had three sections:

The first section consists of a series of motion pictures, each showing the clinical features of a patient being examined, as a physician might see them. The task of the candidate is to recognize and to interpret what he is shown. He does this by responding to a set of multiple-choice written questions based on his observations. Additional information may be given, after which other questions call for a more definitive diagnosis.

Another section, as described in the New England Journal of Medicine article, "consists of standard multiple-choice questions related to pictures of patients or specific lesions, or gross or microscopic specimens. This section may also include questions related to the interpretation of radiographs, electro-cardiograms, funduscopic views, blood smears, or other clinical material that can be shown pictorially or graphically, with the use of color reproduction when color is needed." These are printed pictures, which the Board officials feel have many advantages over slides, in that they are continuously available to the candidate, and can be shown as a group, requiring discrimination rather than simple identification.

* Hubbard, John P., Levit, Edith J., Schumacher, Charles F., and Schnabel, Truman G., Jr., "An Objective Evaluation of Clinical Competence," New England Journal of Medicine, June 24, 1965, page 1321.

The third section, which the Board calls "programmed testing," is designed to deal with a physician's ability to identify, to resolve and to manage the problems of patients. The candidate is confronted with limited information about a sick or injured patient, and must decide what action to take. From a list of procedures, he chooses those he would follow. For each there is feedback, since in making his decision he erases a special ink block in the test answer booklet, under which are revealed the results of that decision, or the new information he has called for. Following this process through several sets of possible choices for action, he continues until the patient improves -- or perhaps dies. Thus this is a step-by-step progression through a sequence of problems, each building on the information gained before. Such a test is scored by giving credit for correct choices of action (as shown by erasures in the answer booklet), and penalties for wrong choices made or for right choices not made.

The new Part III has proven itself to be both reliable and valid.

By 1965, the reliability for Part III (based on the correlation between the two halves of the test) was up to 0.87 -- "a degree of reliability we had not previously considered possible."

An interdisciplinary panel of examiners agreed the test had a high degree of content validity, since it was a good sample of the various facets of clinical competence which had been defined before the test was put together.

While the Board would like to see the test have predictive validity -- to correlate well with subsequent performance as a physician -- "at the present time, no reliable, valid measure of the physician's actual performance with patients has been devised."

A final criterion against which Part III can be judged is that of independence. Does it add something to the testing package? Correlations between Part III tests and the tests of Part I and II have ranged from 0.30 to 0.65 -- high enough to show the relationship between knowledge and clinical competence based on that knowledge, and yet low enough to prove the Part III test is indeed measuring something the other two parts do not.

FLEX -- FEDERATION LICENSING EXAMINATION

The Federation of State Medical Boards of the United States Inc. provides a Federation Licensing Examination (FLEX) for the use of state boards of medical examiners. While its use is not mandatory, its use is growing. Use of this examination by the states provides a reliable, valid, and uniform base for reciprocity among them, and eliminates the variables that have been a barrier to that reciprocity.

Emphasis in the examination, first offered in 1968, is on clinical competence. It is structured much like the National Board of Medical Examiners examinations with three days covering basic science subjects, clinical science subjects, and clinical competence. And it uses pre-tested questions drawn from the National Board's pool of multiple choice questions, as well as from its Part III films, photographs and programmed testing questions.

Since the candidates are not only recent graduates (they must be at least one year out of medical school), but also physicians who have been in practice for many years, the questions are selected in the range of medium difficulty -- neither too easy nor too difficult.

Scores are given for individual subjects and for each day's examination as a whole, and a "FLEX Weighted Average" for the over-all battery of tests is computed by giving basic science a weight of 1, clinical science a weight of 2, and clinical competence a weight of 3 -- acknowledging, according to the Federation, "the states' unique responsibility toward the remote graduate, the physician re-examined after withdrawal from practice for a number of years, and the foreign graduate."

EDUCATIONAL COUNCIL FOR FOREIGN MEDICAL GRADUATES

This Council offers an examination program whereby the graduate of a medical school outside the United States, Puerto Rico and Canada can demonstrate a minimum amount of medical knowledge and receive the ECFMG certification which is required by regulations in two-thirds of the states and by certain American Medical Association and American Hospital Association regulations. Thus the examination represents a type of equivalency procedure, although the Council is careful to state that it does not certify that those who pass it have knowledge equivalent to graduates of American medical schools.

The 360 questions -- in English -- are drawn from the pool of standardized multiple-choice questions maintained by the National Board of Medical Examiners, each having been used in at least one National Board examination. They cover the fields of medicine, surgery, obstetrics and gynecology, pediatrics, and the basic medical sciences.

The passing score of 75 is as nearly equivalent as possible to the passing score of 75 on the Part II National Board examination.

There is also an English test, "designed primarily to test the candidate's comprehension of spoken English."

In addition to passing the examination, the candidate for ECFMG certification must present documentary evidence that he has completed the entire medical course in a foreign medical school.

AMERICAN BOARD OF ORTHOPAEDIC SURGERY

A comprehensive program called the Orthopaedic Training Study got underway in 1964 to develop evaluation instruments to assess competence in orthopaedics, a joint project of the American Board of Orthopaedic Surgery and the Center for the Study of Medical Education of the University of Illinois College of Medicine. It is funded by the Public Health Service Bureau of Health Professions Education and Manpower Training.

The first step in this project was a definition of what constitutes competence in orthopaedics, which was developed by Flanagan's critical incident technique.

Many possible testing techniques were studied; and three new ones evolved from the project, all having substantial reliability and validity.

The Simulated Patient Management Problem, a written test developed along the same lines as the National Medical Board's Part III, - but in fact developed separately - a "programmed" test situation where the candidate builds one decision on another in diagnosing and treating an imaginary patient. (See the section of this report beginning on page 31 for more information about the National Boards and their use of this type of testing).

The Simulated Diagnostic Interview, an oral test in which the examiner plays the role of the patient and the candidate elicits information from him. After twelve minutes, the candidate is given three minutes to present his diagnostic impressions.

The Simulated Proposed Treatment Interview, in which the examiner again plays the role of a patient, and the candidate has three minutes to familiarize himself with the case, after which he must explain the treatment to the "patient". This test is aimed at evaluating effectiveness of physician-patient relationships.

The Study also analyzed three traditional methods of evaluation:

The Multiple Choice Examination, a traditional form of testing orthopaedic residents, which on analysis was revealed to be assessing mainly recall of information.

The Oral Quizzes, given to candidates for certification for many years, five one-half hour quizzes for each candidate, administered by large numbers of practicing orthopaedicists, which on analysis also proved to be assessing recall and recognition of isolated fragments of information.

The Supervisory Rating Form, a new form designed to minimize the subjectivity of such appraisals by introducing specific criteria to guide observers in making their judgments.

Correlations among all these methods indicate that each of the test variables measures important areas of competence not measured by other tests. The Study is continuing to assess these new evaluation methods, as they have been introduced into the Board's certification examination. It is also, with the cooperation of the In-Training Examination Committee of the American Academy of Orthopaedic Surgeons, using these methods to study the rate at which some of the measured elements of competence are achieved by residents at various levels of training -- a study which may lead to changes in residency programs.

While no systematic attempt has been made in this study of equivalency and proficiency testing to survey the test procedures of every medical specialty, a report on this program of the American Board of Orthopaedic Surgery is included here because the Orthopaedic Training Study has included a comprehensive evaluation of old testing methods and the development of new testing methods from which other fields may have something to learn.

NURSING EXAMINATIONS

The nursing profession has a long-time interest in the problems of granting credit for past training and experience.

Licensed practical nurses entering diploma schools or associate degree programs to become registered nurses wish some credit for their basic nursing training and experience. And registered nurses from diploma or associate degree programs returning to school to get a baccalaureate degree also wish some credit for the many facets of nursing they have studied and practiced.

As early as 1945, the National League for Nursing Education was considering related problems as it developed its earliest tests for post-graduate nurses. By the time of the 1967 NLN Convention, interest was considerable, as seen in this resolution:

> Since it is understandable that persons in any educational field may change their goals, and
>
> Since sound educational principles discourage repetition of materials already learned and internalized to the point of effective application, and
>
> Since it is appropriate and desirable to encourage nurses who wish to continue their education so they can assume greater responsibility for health services to people,
>
> The NLN shall encourage nursing education programs which are integral units of educational institutions to explore further mechanisms which will make it possible for nurses to demonstrate previously acquired knowledge and competence in order to avoid unnecessary repetition of nursing content.

In 1967, 83% of the RN's finishing nursing programs were in diploma and associate degree programs, so there is a large pool of nurses who might return for college degrees if the incentive were provided.

A variety of "challenge examinations" have been used by nursing schools to allow credit for past training and experience. Many of these have been locally constructed tests. Some nursing schools have used NLN tests which were devised for other purposes. An NLN test expert expressed some concern about this practice, because the NLN Graduate Nurse Examination, which some use, is too old, and the NLN baccalaureate Achievement Tests, used by others, are likely to be seen by the applicant soon again in the course of her nursing school program, making test security impossible to maintain. There is no security problem in diploma or associate degree program use of the lower level NLN Achievement Tests for LPN's, since there are advanced forms of these tests which can be used in the training programs themselves.

New York State has developed a program of five tests for this purpose, which are being used by institutions in the State to grant credit. This program is described in a separate section of this report on pages 45-48.

The NLN Measurement & Evaluation Services devoted its pre-convention meeting in May 1969 to this problem, and distributed a questionnaire asking members whether NLN should develop a battery of national challenge examinations for this purpose. The respondents directing baccalaureate programs all indicated they admit RN's - either with credit or with advanced placement. And all of their institutions make use of some proficiency tests - but these may include anything from the College-Level Examination Programs' tests in liberal arts subjects (see pages 49-51 of this report) to locally-produced nursing tests. There was no agreement among these respondents as to where emphasis should be placed or in what content areas challenge examinations should be developed by NLN. And without such a mandate from the credit-granting institutions, NLN has no present plans to develop national challenge examinations.

In this area of testing nursing students, as in testing those in training programs, there is concern over the problems of evaluating clinical competence. Various forms of rating scales for the use of supervisors have been developed, as noted in the bibliography of this report. None has been universally acclaimed or widely used, and this remains an area for study by the nursing profession.

A work-study project for upgrading practical nurses to become registered nurses is underway at Hunter College of the City University of New York, under a Public Health Service grant, and with the cooperation of the New York City Health Services Administration and the New York City Department of Personnel.

Nurses admitted to the program have received "appropriate recognition of skills already mastered," as evaluated by practical nursing examinations developed by the Psychological Corporation. Credit is given toward the usual "Fundamentals of Nursing" course. Competition was keen for admittance to the first group in 1969, for 25 places, 600 LPN's working in the Department of Hospitals took the test. An English proficiency examination was required as well, along with satisfactory grades in practical nurse school and evaluation records from the Department of Hospitals.

Each student undertakes a 17-month trimester program which will provide some 1,500 classroom and laboratory hours of study, at the same time working four hours a day with payment at the full-time rate by the Department of Hospitals.

The three and one-half year project calls for 75 LPN's to have this experience. Each will be qualified to take the State examination for registration as a professional nurse, will have received six academic credits, and will be eligible to receive 36 nursing credits upon completion of the appropriate proficiency examination administered by Hunter College.

High correlation between a practical examination and other methods used in selecting dentists for Regular Corps commissions in the U.S. Public Health Service was found in a study reported ten years ago by Sidney H. Newman and Margaret A. Howell of the U.S. Public Health Service and Norman Cliff of Educational Testing Service. Although the methods described are no longer used in selection of dentists for the Corps, the comparison of the various selection methods continues to be of interest.

The practical examination required each candidate to make an oral diagnosis and recommend therapy, to prepare and fill a cavity, and to construct a gold inlay in a synthetic model tooth. Ratings on the first two tasks were made independently by two dentist observers; the quality of the inlay was rated independently by a board of three dental officers in Washington.

Four objective three-hour professional examinations were given each applicant, consisting of multiple-choice items constructed to measure professional judgment and reasoning as well as factual knowledge.

An Interview Board assessed the candidate's personal qualifications.

Finally, an Evaluation Board assessed the applicant's training, experience, and work record.

In the 1959 study referred to, the authors used the practical examination as the criterion measure of the dentist's clinical ability, and sought to determine whether the other selection methods actually measured the same qualities in the applicants. Comparisons showed they did indeed.

The best predictor of performance on practical examination was the file evaluation, "but an objective professional examination significantly improves prediction based on the file evaluation alone." Data regarding the interview were inconclusive.

The possible significance of this study was pointed out by the authors:

> Generalization to other professional groups may not be entirely justified, but the results of this study are suggestive of the usefulness of objective professional examinations and formalized, quantitative evaluations of training and experience in predicting professional competence. In situations where practical examinations are not feasible as a part of the selection battery, this study suggests that other methods of assessment and evaluation such as the ones used here may be fairly satisfactory substitutes in that they may be expected to be quite highly correlated with performance on a practical examination.

CERTIFYING EXAMINATIONS FOR DENTAL ASSISTANTS

The experience of the Certifying Board of the American Dental Assistants Association in Chicago is interesting because they have recently put most of their former performance examination into multiple choice objective form.

Until the Fall of 1969, the dental assistants' examination was in two parts -- a 2-hour written examination, followed by a $3\frac{1}{2}$-hour practical clinical examination.

The performance portion of the examination covered fourteen items on which candidates were rated, including personal appearance, ability to identify and place tools, ability to prepare dental charts, typing and bookkeeping skills and procedures, processing and mounting of Xrays, identification and selection of armamentarium, and preparation of impression and filling materials.

Some 1,200 examiners were needed -- six or seven for every 20-40 candidates in a test site. They were provided rating sheets breaking down each task into small components to be checked "satisfactory" or "unsatisfactory." Although items were not necessarily of equal importance, they received equal weight in totaling scores. The total checkpoints for each problem varied to afford correct weighting among the problems.

Beginning in the Fall of 1969, the Certifying Board has made a major change in its examination program, bringing most of the practical examination into paper-and-pencil format, and doing away with the observed clinical test. The new testing program has been developed by the Board itself.

The 150-item written examination has been increased to 200 items, incorporating most of the clinical problems through use of photographs and other means. Instruments are to be identified through pictures, rather than by actual handling. A dental chart is to be filled out, and questions about it answered in objective format. And so on.

To test manipulative skills, several practical problems remain as part of the test battery. But each has a product, and that product is evaluated centrally later, not by observation at local test centers. Each candidate must send to Chicago the evidence that he or she can expose, process and mount a series of Xrays, take an impression of a study model, make a stone cast, and construct a quadrant tray.

A major reason for making the change away from performance testing is that virtually everyone who passed the written examination also passed the clinical examination in past years. The two tests were apparently measuring the same things, and at considerable expense in money and manpower. It was also felt that the practical, as formerly administered, was not sufficiently objective in its evaluation.

It is hoped the new system will prove somewhat less expensive and a much more objective evaluation of the kind of work the candidates can do.

PHYSICAL THERAPISTS EQUIVALENCY EXAMINATION

The Division of Health Standards of the Community Health Service, U.S. Public Health Service, is currently having developed an equivalency examination. The examination will evaluate the knowledge of state licensed physical therapists without full professional training, to enable them to qualify for full participation in the Medicare program.

As originally conceived, this examination was to have been partly a performance test in response to requests from physical therapists who wanted to prove they could "do the job" despite their lack of formal training. As presently planned, it will be instead a multiple-choice written examination.

Test experts advised against the performance test for several reasons: its probable high cost compared to the possibility that it might measure nothing a written test couldn't assess much more easily, the lack of reliability and validity found for many performance tests, and the problem pertaining specifically to this field that it would be nearly impossible to find patients with uniform ailments.

The written test is being produced by Cybern Education Inc., under a contract calling for it to: (1) appoint consultants to advise on a subject-matter outline, and assist in test development and review, (2) prepare a non-theoretical test, whose questions are designed for persons whose skills and knowledge were acquired primarily through work experience and (3) test the test, evaluating its validity and furnishing norm information.

The test is due to be completed for a first administration in early 1970.

PHYSICAL THERAPY ASSISTANTS EXAMINATION

Another examination in the field of physical therapy is under development -- that for physical therapy assistants, who are graduates of new associate degree programs in the field.

The Public Health Service contract with the Professional Examination Service of the American Public Health Association calls for PES to define the role and duties of this worker, and the knowledges and skills needed for competent practice in the job, and then to design an examination which will test those knowledges and skills. Thus the test is job-oriented, not specifically education-oriented.

While the test will probably be written, the contract allows for the possibility of developing oral and practical components as well.

The test is to be available by December 1970.

NAVY TESTING

Because of the situations in which Navy medical personnel are likely to find themselves -- on small ships, far from comprehensive, well-staffed hospitals -- each medical corpsman is trained to accept broad independent responsibility.

Graduates of the advanced medical laboratory course are no longer tested on the specifics of their particular Navy Enlisted Code as laboratory workers, but rather on a much broader range of information in the allied health fields. Advancement is based on these broad-reach tests, in which each individual competes with everyone on the same level, regardless of specialty.

Thus there are no proficiency tests in the medical laboratory field beyond those connected with the training course itself.

The advancement tests, given semi-annually, are three-hour written tests of 150 multiple-choice questions. They include questions on first aid, pharmacy, mathematics, and such laboratory questions as any medical corpsman should be expected to answer. Questions on ward management and patient care are a major part of tests for the lower grades, and are gradually replaced by questions on administrative functions for higher-grade personnel. Some general military questions are included, as well.

The passing mark is 65%. Those who fail the test may be required to take a correspondence course before taking the test again six months later, or may be expected to study on their own. Those who continue to fail on each re-examination may have trouble re-enlisting.

TESTS IN OTHER FIELDS

TESTS OF GENERAL EDUCATIONAL DEVELOPMENT (GED)

The best known and most widely used equivalency tests are the Tests of General Educational Development (GED), sponsored by the American Council on Education's Commission on Accreditation of Service Experiences (CASE) and administered by the state departments of education.

This testing program was established at the end of World War II to provide a way for veterans to obtain the high school diploma required for admission to college. For 20 years, it has continued to prove useful for veterans, and also for other adults who did not finish high school but later need the diploma to qualify for employment or further education. The Armed Forces also accept satisfactory test scores where high school is required for assignment to service schools or for promotion.

In 1968, there were 265,499 persons who took the GED tests at 1,336 testing centers across the country. Their average age was 29½, and they had had an average of 9.7 years of school. Forty per cent of them took the tests because they planned further study. Thirty per cent failed to meet state-set standards.

The GED test battery consists of five comprehensive examinations: English, social studies, natural sciences, literature, and mathematics. According to a CASE publication:

> The GED Tests have been designed to measure as directly as possible the attainment of some of the major objectives of the secondary school program of general education. The emphasis is on intellectual power rather than detailed content; on demonstration of competence in using major generalizations, concepts, and ideas; and on ability to comprehend exactly, evaluate critically, and to think clearly about concepts and ideas.

Each test takes approximately two hours, although no time limits are set.

Civilians--including veterans--take the GED tests at centers designated by state departments of education, and at VA hospitals and federal correctional and health institutions. Military forms of the tests are administered to personnel on active duty through the United States Armed Forces Institute, at USAFI testing sections.

Each state department of education sets its own standards for use of the test results. CASE recommends that states set the passing score at the level at which approximately 20 per cent of their in-school seniors would fail.

NEW YORK COLLEGE PROFICIENCY EXAMINATION PROGRAM (CPEP)

The New York State Education Department established its College Proficiency Examination Program (CPEP) in 1962, "in an effort to open up the educational opportunities of the state to individuals who had acquired college-level knowledge in ways other than through regular classroom attendance."

With the guidance of nearly 200 college faculty members who serve as consultants, the program has produced more than 30 examinations which can be used to evaluate an individual's off-campus learning. Most of these tests are in first- and second-year college courses. Sciences in which tests have been developed are biology, chemistry, earth science, geology, and physics.

While the State Education Department prepares, administers, and grades the examinations, it is up to the individual colleges and universities to accept them for credit, setting whatever standards they wish. Generally, the acceptance by the academic community is good, with a marked increase as the program has gotten under way, according to William A. Lyons, former director of the Program and now secretary to the Board of Regents of New York State.

A majority of New York institutions--and some out-of-state--are accepting credit under the program. They vary considerably in their regulations concerning that credit. None offers the possibility of earning a degree without any classroom attendance. At least one institution allows 66 credit hours; most have lower limits. Some grant credit only provisionally until the student has been on campus for a certain period. Some require payment of fees for the granted credits; others do not.

The test results are also accepted by the State Education Department to meet some of the specific requirements for teacher certification.

A recent change has done away with the overlapping of this New York State program with the national program set up later by the College Entrance Examination Board's Council on College-level Examinations. A number of New York tests have been discontinued, with the announcement noting many are being offered by the College-Level Examination Program (CLEP). Other tests have been discontinued because of lack of demand. These may be revived, but meanwhile, available funds can be used to develop and administer tests in other fields.

The examinations are offered twice a year, in January and May, at a dozen campus locations in New York State. Most take three hours. The fee is $15 per examination. There are no prerequisites for taking the exmminations.

According to CPEP's announcement of its testing program, the examinations "are reasonably difficult and demanding examinations, as they must be, in order for colleges to recognize successful performance on them for credit. It should be remembered that college professors have regular contact with on-campus students and have many opportunities to gain an accurate sense of each student's capabilities. The applicant for credit by examination is evaluated just once through the examination. It is logical, then, that the person seeking credit by examination should be prepared to perform somewhat above the minimum expected for the on-campus student."

In 1968, the New York program offered for the first time three examinations in the nursing field, designed to offer credit for the registered nurse who is returning to school to work for a baccalaureate degree. The following year, a "Fundamentals of Nursing" test was offered for the licensed practical nurse entering an RN program and wishing to get some credit for her LPN training and experience. A fifth examination, an associate degree "Maternal and Child Nursing" test, is now ready for administration in January 1970.

Each of the tests was developed under specifications laid down by a six-member faculty committee of nursing educators in the State. Each uses 150 multiple choice questions. Norms are developed by giving the tests to students actually completing each course. With these as with other CPEP examinations, the policy directive is that the committee "must assign grades for raw scores in such a way that if a group representative of students studying the subject in colleges in New York took the exam, the usual distribution of grades from A to F would result ."

The five tests are described as follows by CPEP:

FUNDAMENTALS OF NURSING (recommended credits: 5-10)

The College Proficiency Examination in Fundamentals of Nursing is designed to test the candidate's knowledge and understanding of the basic practice of nursing. The examination assumes preparation equivalent to that of the student who has taken a basic course in fundamentals of nursing at a diploma school of nursing or in an associate degree program of nursing.

Objectives. The candidate will be expected to demonstrate:

1. a knowledge and understanding of facts, trends and terminology related to the content areas listed below;

2. the ability to recognize and apply principles and theories to a variety of nursing situations;

3. the ability to assess simple nursing situations and propose an appropriate plan of action.

(There follows a list of content areas.)

MATERIAL AND CHILD NURSING, BACCALAUREATE DEGREE LEVEL (recommended credits: 6-12)

The CPE in Maternal and Child Nursing is designed to test the candidate's knowledge and understanding of maternal and child nursing. The emphasis is placed upon the application of theory to the nursing situation.

The candidate should be prepared to demonstrate:

1. a knowledge of facts, trends and terminology related to the content areas listed below;

2. the ability to recognize and apply principles and theories to a variety of nursing situations;

3. the ability to use a problem-solving approach in assessing nursing situations and in making judgments concerning appropriate nursing intervention.

(There follows a list of content areas.)

MEDICAL-SURGICAL NURSING (recommended credits: 8-12)

The emphasis of the College Proficiency Examination in Medical-Surgical Nursing will be on the nursing process. The candidate will be expected to:

1. know specific facts, principles and theories;
2. assess situations by analysis and synthesis;
3. apply good nursing principles;
4. evaluate situations as to their effectiveness and implications.

(There follows a list of content areas.)

PSYCHIATRIC-MENTAL HEALTH NURSING (recommended credits: 6)

The emphasis in the College Proficiency Examination in Psychiatric-Mental Health Nursing is placed upon the application of theory to the nursing situation. The candidate should be prepared to demonstrate:

1. a knowledge of facts, trends, and terminology related to the content areas listed below;
2. the ability to recognize and apply principles and theories to a variety of nursing situations;
3. the ability to utilize a problem-solving approach in assessing nursing situations and in making judgments concerning appropriate nursing intervention.

(There follows a list of content areas.)

MATERNAL AND CHILD NURSING, Associate Degree Level (Recommdned credits: 4-6)

The College Proficiency Examination in Maternal and Child Nursing, Associate Degree Level, is designed to test the candidatee's knowledge, understanding, and application of principles in the nursing care of parents and children. The examination assumes preparation equivalent to that of the student who has taken a course in maternal and child nursing in an associate degree program of nursing.

Obejctives: The candidate will be expected to demonstrate:

1. a knowledge and understanding of facts, trends and terminology related to the content areas listed below;
2. the ability to recognize and apply principles and theories to a variety of nursing situations;
3. the ability to assess commonly-occuring nursing situations and propose an appropriate plan of action.

(There follows a list of content areas.)

From the beginning of its work on the nursing examinations, the Program has been studying the possibilities of developing clinical performance testing procedures to supplement the objective written examinations. In August 1969, Donald J. Nolan, director of CPEP, reported:

We are in the process of developing guidelines concerning the clinical or practical aspects of the Medical-Surgical Nursing CPE. At present we do not intend to administer this part of the examination ourselves, but rather will rely on the institutions accepting the results of the paper-pencil part to examine the candidate in the practical application of his or her skills. This portion of the CPE, optional for use by individual institutions, will be available hopefully in time for the May 1970 administration.

As of May 1969, more than one thousand nursing tests had been given. Some candidates, of course, took more than one. The results were as follows:

GRADES	FN*	M&CN*	M-SN*	P-MHN*	TOTALS
A	37	7	18	10	72
B	104	107	117	75	403
C	118	96	70	69	353
D	103	11	23	20	157
F	49	6	10	6	71
TOTALS	411	227	238	180	1,056

* These abbreviations refer to the four nursing tests listed above.

The CPEP nursing examinations are gradually receiving acceptance from the baccalaureate and associate degree nursing programs in New York State. A recent tally indicates that at least 12 of New York's 28 baccalaureate nursing programs are granting credit, while only one has officially declined to do so. And 20 of 32 associate degree programs will grant credit.

The nurses who passed the 828 examinations through May 1969, are known to have made 345 requests for credit at 43 nursing programs in New York State, of which 164 requests at 18 nursing programs are known to have been granted.

At least six baccalaureate programs grant blocks of credit for all three baccalaureate examinations, ranging from 6 to 30 credits. SUNY at Buffalo grants 32 credits for the four nursing examinations in use to date.

Several requests for credit at out-of-state nursing schools have been made, and three of these programs are now reviewing the tests.

THE COLLEGE-LEVEL EXAMINATION PROGRAM

In 1965, the College Entrance Examination Board, which has for years offered entrance and advanced placement examinations for use by colleges and universities, established its College-Level Examination Program (CLEP) "to enable individuals who have acquired their education in non-traditional ways to demonstrate their academic achievement." It provides on a national basis the same sort of testing program originated by New York State.

The examinations offered by CLEP are of two types: a battery of five General Examinations, measuring general educational background of students who have had one or two years of college instruction or its equivalent, and a series of Subject Examinations, each covering one academic course. There are no prerequisites for a candidate who wishes to take any of these examinations, as there are none for the New York CPEP tests.

Some 450 colleges have indicated to CLEP they will award credit on the basis of these examinations. The list grows rapidly, and the presumption is that others will follow suit as they receive requests for such credit. J.Douglas Conner, executive secretary of the American Association of Collegiate Registrars and Admissions Officers, says: "It does appear that the College-Level Examination is receiving a fairly broad acceptance." As is true with the New York program, the colleges use the examinations in many different ways. Minimum acceptance scores vary, as do the amounts of credit which will be granted for any one examination, the maximum amount of credit allowable, and other attendant regulations.

In addition to their use for credit for off-campus learning, the examinations are serving to help in assessment of transfer applicants, to allow a junior college to compare its graduating sophomores with national norms, to provide information for educational counselling of students, to recognize the continued growth and development of individuals in the military service, and to assist in the evaluation and placement of foreign students.

Organizations and agencies other than colleges and universities have used the General Examinations as a measure of college equivalency for certification or promotion purposes. For example: a state board of bar examiners requires them of all applicants for the bar exam who do not have college degrees; a state library certification board uses them to determine the equivalence of two years of college education for the purpose of certification as a librarian; a quasi-governmental agency has used them to meet a promotion requirement, as has at least one company. It should be emphasized, however, that this use of the examinations for professional or employment purposes does not provide any academic credit for the individual concerned.

The examinations are developed by Educational Testing Service, making use of examining committees composed of faculty members and representatives of business, industry, and certification or licensing agencies as appropriate.

Some 200,000 individual CLEP tests have been given on a paid basis by colleges and universities (CLEP also allows and encourages colleges to give trial administrations of the test, to establish local norms, at no charge). More than 500,000 individual General Examination tests were administered through the United States Armed Forces Institute (USAFI) to members of the armed forces between July 1965 and August 1968.

And 6,556 tests were administered to 3,900 individuals at special CLEP test centers around the country from October 1967, when the Program began offering them to the public at large, through June 1969. The tests are administered each month by these centers. The fees are $15 for the battery of General

Examinations (or part of the battery), and $15 apiece for the Subject Examinations. A candidate may repeat General Examinations once within a year's time, with special permission, but may not repeat a Subject Examination for a period of a year.

The General Examinations are intended to measure undergraduate achievement in five basic general education areas. Each is in effect a separate test:

English Composition
Humanities (subscores in Fine Arts and Literature)
Mathematics (subscores in Basic Skills and Course Content)
Natural Sciences (subscores in Biological Science and Physical Science)
Social Studies -- History (subscores in Social Sciences and History)

Each of these five tests contains about 100 multiple-choice questions. The English Composition test is an hour long; the other four are 75 minutes each. All five are usually administered as a battery, although they can of course be used separately as any educational institution or other organization may wish.

Subject Examinations are currently available in 21 widely-taught undergraduate courses. Each relates directly to the course content as would a final examination.

CLEP intends to develop more than 100 such examinations. Those now available in the sciences are general chemistry and geology, with a biology test under development.

Each consists of a 90-minute multiple choice test of approximately 100 questions. All but the tests in algebra and trigonometry have optional essay sections, which are forwarded directly to the college or university or other institution for grading.

While the Subject Examinations are different from the General Examinations in that the former measure the outcome of specialized courses in particular fields and the latter sample widely the content of the major disciplines, all the CLEP tests have these stated attributes in common:

The examinations stress understanding, not merely retention, of facts, the ability to perceive relationships, and the grasp of basic principles and concepts in each discipline.

The examinations are constructed in such a way that an individual does not need to be able to answer all the questions on them to demonstrate competence.

The examination questions cover a range of difficulty both in the depth of understanding required and the skills and abilities measured.

National norms for the General Examinations have been developed for the end of the college freshman, sophomore and senior years. The norming samples for the Subject Examinations consist of students who are completing one year (or one semester, for certain tests) of college instruction in the subject involved.

Scores on the examinations are derived by counting the number of correct and incorrect responses and subtracting a percentage of the wrong answers to allow for guessing. These scores are then converted to a scale of 200 to 800 for the General Examinations, or 20 to 80 for the Subject Examinations and the subscores of the General Examinations. The means are 500 and 50, respectively, and two-thirds of the norming groups received scores between 400 and 600, or 40 and 60, respectively.

A CLEP announcement indicates the difficulty level of the tests:

> You do not have to answer all, or even most, of the questions correctly to earn acceptable scores on these tests. For example, a person who answers only two-thirds of the questions on the [General Examination] English Composition Test and has incorrect answers for about one-fifth of them will still obtain a score well above average when compared with a representative sample of college sophomores.

Of course the matter of what scores are "acceptable" for what amounts of credit is determined, as noted above, by the individual institutions concerned. A research study is underway analyzing the success of some 1,100 people who have taken examinations at CLEP testing centers. This report is due out sometime after January 1, 1970.

CLEP was designed primarily to assist institutions to recognize and reward the educational achievement of older students attained outside the regular classroom setting. Its officials estimate that 25 million adults are engaged in some form of education each year, about half of them outside a classroom setting. This indicates a sizeable group of potential users for the CLEP tests.

CREDIT-BY-EXAMINATION PROGRAMS OF COLLEGES AND UNIVERSITIES

Since 1895, the University of Illinois has granted credit to students who passed special departmental examinations.

Of 300 North Central colleges and universities answering a 1959 questionnaire on the subject, 171 granted college credit by examination. In 105 of these institutions, all departments could or did participate. Another 45 limited the practice to specific departments. Some placed a limit on the amount of credit that could be earned; most students earned less than 15 hours. In his report on the survey, J. A. Hedrick indicated faculty acceptance of the concept of credit by examination was increasing.

Ten years later, while no survey has recently been done, there is no doubt that the practice of granting credit by examination has increased, largely because of the availability of the College-Level Examinations of the College Entrance Examination Board. As noted elsewhere in this report, some 450 colleges and universities have indicated to CLEP that they will grant credit for CLEP tests, with the amounts and the attached requirements varying from school to school. CLEP officials find there are many more institutions which are willing to grant credit, although they have not filed formal policy statements. And many others are apparently waiting to be asked.

Some institutions have carefully thought-out policies and programs of credit by examination, making use of CLEP and New York's CPEP tests as well as local tests made by teachers of various courses. For example:

Syracuse University offers credit by all of these methods for fully matriculated students, up to a maximum of 30 semester hours, and offers advanced standing through examinations as well. Its University College Directed Self-Study Program gives credit for what a student already knows if that knowledge is relevant to the content of the program, and he may skip to a higher level and avoid loss of time in restudying areas he already knows.

Boston University's descriptive brochure, "College Credit by Examination," details the ways of obtaining credit through CLEP and other College Board tests and through the University's own subject examinations in a number of courses.

Cornell University's College of Agriculture, on the other hand, which formerly had a well-developed local testing-for-credit program, now relies on the CLEP and CPEP tests almost exclusively.

The Advanced Standing Program at Louisiana State University offers up to 30 hours of credit by examination--CLEP exams and LSU departmental exams.

The Brooklyn College Special Baccalaureate Degree Program for Adults has special tutorial seminars for mature adults with "a background of liberal life experience," some of whom may be exempted with credit on the basis of examinations.

Beaver College gives its departments discretion whether to use locally constructed or standardized tests in each case where an individual seeks credit, and whether to give credit or advanced standing. There is no limit to the number of course credits available by examination.

Placement tests are used by the Bachelor of Liberal Studies program at the University of Oklahoma to guide applicants for admission to this independent study program. "A few adults with unusually rich experience and prior learning may complete the BLS in two years or less."

This has not been a systematic sampling of the use of credit by examination, but only a run-down of some of the kinds of programs being offered, included here to indicate the widening acceptance of the credit-by-examination idea at the nation's colleges and universities.

TRADE AND INDUSTRIAL EDUCATION TEACHERS COMPETENCY EXAMINATIONS

"Occupational competency testing" is the name being given in the trade and industrial education field to the evaluation of the technical skills possessed by persons who wish to beoome teachers in vocational industrial/ technical education programs.

As these education programs expand, it becomes increasingly necessary to find competent teachers. Most of the states have sought individually to deal with the problem of screening these teachers. Now there is underway a "Consortium" research project designed to provide a national approach to the problem. The project is funded by the Bureau of Research of the U.S. Office of Education, with a grant to the Graduate School of Education of Rutgers University, which has set up the National Occupational Competency Testing Project, now in its first stages.

The Project itself is the outgrowth of a 1966 meeting, where 23 states participated, which established the fact that states need help in developing such tests, and that a national effort would reduce duplication, achieve economies, produce more reliable tests, upgrade the vocational teaching profession, and still allow for flexibility by giving each state wide latitude in the use of the tests.

The project will survey the "state of the art" of occupational competency testing and prepare a handbook for the development of tests. It will develop pilot competency tests, establish their reliability and validity, and develop scoring, interpretive materials and guidelines for use of the tests. Finally, it will "put into operation a feasible program of occupational competency testing under a Consortium of States arrangement."

Some colleges and universities offer academic credit for trade or industrial experience. Iowa State University, for example, gives up to 30 semester hours of credit for a written, performance, and oral examination in the individual's technical field. At the University of Tennessee, up to 27 quarter hours may be earned through examinations in technical areas developed by the Department of Industrial Education.

ENGINEERING TECHNICIANS EXAMINATIONS

In 1961, the National Society of Professional Engineers set up its Institute for the Certification of Engineering Technicians, in order to raise performance standards of engineering technians and determine their competence through investigations and examinations.

The Institute certifies technicians in three grades:

1. Junior Engineering Technician--two years of experience or graduation from an accredited two-year program in engineering technology.

2. Engineering Technician--five additional years of experience; applicant must be at least 25 years old, and may be required to pass an examination (which is waived for graduates of the accredited schools).

3. Senior Engineering Technician--another ten years of experience; no examination is required, because too many specialties are possible.

The Institute's certification program provides recognition, status, and the incentive for further study and for more extensive work experience.

The Engineering Technician examination was developed with the help of an advisory council, and was tested in schools and industries. It is set at the level expected of a graduate of a two-year technicial institute. Several hundred candidates have taken it since it was first offered.

U.S. CIVIL SERVICE COMMISSION EXAMINATIONS

The Civil Service Commission has two equivalency examinations.

An examination is given for people who have partial training and/or experience in the field of library science, who may become Civil Service librarians if they pass it. While a CSC spokesman said they have ample evidence that someone without a master's degree in library science can do the work, he also reported CSC is not happy with this particular test. In one-half day, it attempts to assess what one should have learned in four years of college work. The passing rate is only 20%.

Those who deal with the Commission's accounting test are satisfied it does what it was set up to do: to test whether a candidate has learned to be a professional accountant through experience, rather than via the usual four-year college accounting course followed by the CPA exam. The test is used largely for in-service promotions, serving as a bridge whereby people in accounting technician jobs can move up to professional positions. One reported difficulty is that of keeping abreast of new developments in the field; it is expensive to keep the test up-to-date.

In setting other standards, including those for medical technologists, the CSC operates with the assumption that experience and education can be equated. But the result is the opposite of the programs discussed above. Because it is an experience-based service, CSC allows applicants with advanced degrees to count them as part of the credit toward experience requirements.

OTHER PROCEDURES

PRACTICES OF ALLIED HEALTH SCHOOLS IN GRANTING CREDIT BY EXAMINATION

Colleges and universities and post-secondary schools offering education and training for health occupations are becoming concerned with the problems of career mobility and advancement. At the November 1969 meeting of the Association of Schools of Allied Health Professions, both its Council on Baccalaureate and Higher Degree Programs and its Council on Associate Degree and Certificate Programs indicated that equivalency and career mobility would be a major program emphasis of their newly-formed organizations.

Some institutions have begun to facilitate the entry of experienced students into their programs by offering certain amounts of credit. Although we have made no attempt to do a systematic sampling of programs and plans, the examples which follow indicate the sorts of things which are being done in this area:

At the School of Allied Health Sciences of the University of Texas Galveston Medical Branch, officials have visualized the assistant or technical level educational program as being a part of the professional course of study, and are thus enabling two-year associate degree graduates to become accepted by the professional schools with only a minimum loss of time or credit. While they may be required to take additional work in advanced basic sciences, they do not have to repeat elementary sciences they have already mastered.

Cuyahoga Community College in Cleveland allows students entering its new associate degree Medical Laboratory Technician program 19 credits for successful completion of the course material in its one-year Certified Laboratory Assistant program.

Miami-Dade Junior College in Florida is in the process of instituting a credit-by-examination program which will ultimately be extended to all courses on the campus, and under which students could earn 45 credits in a 60-credit program. Students in the Division of Allied Health Studies who are licensed or certified in their particular field are given credit for all of the technical courses, provided they take one laboratory course in their field at the college. But no specific policy decisions have as yet been made regarding credit toward the medical technician two-year degree.

C. W. Post College of Long Island University grants full credit for the year of training as well as for applicable academic courses to registered medical technologists enrolling in its Program in Medical Biology.

St. Petersburg Junior College in Florida has a four-semester-credit core course entitled "Survey of Health Related Fields" for which equivalency tests have been given this year. There are also equivalency tests for basic nursing and basic physical therapy courses, three-hour laboratory beginning-skill development courses. In developing the new medical laboratory technician program, the College will attempt to help persons take examinations, with the idea that those who are knowledgeable, safe for patient care, and secure in their background material should be able to move on more rapidly within the framework of the proposed course of study.

The Program in Respiratory Therapy at Northeastern University in Boston has a newly developed series of examinations tied into a career ladder in the field of inhalation therapy. Up to 31 credits toward the 93 required for the three-year cooperative associate degree are obtainable by a candidate who can pass the battery of examinations in inhalation therapy. The way is open also for him to obtain the other necessary credits in applied sciences and liberal arts through the CLEP tests, so that theoretically, at least, he may achieve an associate degree from Northeastern by examination. The examinations evaluate knowledge and skills gained by non-traditional means, certifying present competence, irrespective of the route traveled to get to that level of competence.

A junior college in the Southwest proposes to give military medical corpsmen blocks of credit toward the associate nursing degree, based on a comprehensive equivalency examination to be developed covering many small blocks of knowledges and skills. A candidate would have his program individually tailored for him depending on the results of his examination, and would have to take only that training in which he is deficient. The college views this as a possible model for the development of equivalency tests in other health occupations, if the hoped-for funding is forthcoming.

Officials at a number of institutions have indicated they are considering or working on the problems involved in granting credit for work experience in the health field. These include the Hunter College Institute of Health Sciences of the City University of New York, the Program in Health Occupations Education at the University of Iowa, the School of Allied Medical Professions of the Ohio State University, the School of Allied Health Professions of the State University of New York at Stony Brook, the Health Careers Program of Albert Einstein College of Medicine of Yeshiva University, and others.

Early returns to a survey by the American Society of Medical Technologists of colleges and universities conducting baccalaureate programs in medical technology indicated a substantial number either had a policy for granting academic credit on the basis of examinations or would consider allowing such credit if proper guidelines were developed. It was not clear whether this was credit for liberal arts subjects or for technical or clinical knowledge.

THE COMMISSION ON ACCREDITATION OF SERVICE EXPERIENCES

The Commission on Accreditation of Service Experiences of the American Council on Education was set up immediately following World War II to review military service courses and make recommendations as to how many credits college and university admissions offices might give to graduates of these courses.

The Commission also sponsors the General Educational Development Testing Program. For information about the GED tests, see page 44 of this report.

The credit recommendations of the Commission are advisory only, and each institution is of course free to grant any number of credits or none.

The recommendations are made with the help of expert consultants in the field who assess the course materials and make independent judgments which are compiled by the Commission. The credit suggestions are published in the Commission's Guide to the Evaluation of Educational Experiences in the Armed Services. And changes following publication of the Guide are available to colleges and universities from the Commission's advisory service.

Consultants base their recommendations for credit on those phases of the training which have counterparts in civilian education. "Credit recommendations are made only for those training programs in which there is an adequate demonstration of academic achievement by those who complete the courses," according to a Commission announcement. The Commission does not evaluate on-the-job training or service extension courses.

The Commission's recommendations for military medical laboratory courses in its 1968 Guide are as follows:

> Air Force courses for basic and advanced medical laboratory specialists: 30 semester hours for a major in medical technology; 10 semester hours for a minor in chemistry or biology. (These courses are considered only as a 50-week combination, and not separately.)
>
> Army 50-week course for medical laboratory specialists: 30 semester hours for a major in medical technology; 10 semester hours toward a minor in chemistry or biology.
>
> Navy 52-week course in clinical laboratory technique: 12 semester hours in bacteriology and blood chemistry.

Despite these recommendations, the colleges are reluctant to give this much credit without some verification of what the medical corpsman has learned from them. In practice, medical corpsmen return to civilian life currently and find themselves able to attain only the first rung of the career ladder in the laboratory--a ranking equivalent to the Certified Laboratory Assistant (CLA), whose background is a hospital-based year of training. They may be eligible for reciprocal certification, without examination, by the Committee on Certified Laboratory Assistants.

Colonel James J. Young has studied Army medical corpsmen released to the Reserve in 1968, for a Ph.D. thesis soon to be published by the University of Iowa, entitled: "Former Servicemen of the Army Medical Department--A Profile and Assessment of an Untapped Resource of Allied Health Manpower." In this study, Colonel Young compiles the evidence about the backgrounds and training of these medical corpsmen, indicates their desire to enter the civilian health field and the impediments to their doing so, and documents their eagerness to take equivalency examinations to obtain advanced college standing on the basis of their military specialty training. A summary of the highlights of this research is Attachment 6 page 83 of the present study.

LABORATORY PERSONNEL PROCEDURES IN OTHER COUNTRIES

In the hope of obtaining information about how laboratory personnel are evaluated and utilized in other countries, letters were sent to a number of health departments. Unfortunately, few of them brought forth information. This may be a fruitful subject for future inquiry.

We were able to obtain some information from Canada and from Great Britain, and we also had a reply from Sweden.

There is no national or provincial licensing of laboratory personnel in Canada. The Canadian Society of Laboratory Technologists is the only certifying body. It presently offers certification at the following levels: (1) Laboratory Assistant, (2) Registered Technologist, (RT) General, (3) Registered Technologist, Subject, which requires passing a more difficult examination in one or more of seven disciplines, (4) Advanced Registered Technologist (ART) in one or more of seven subjects, (5) Licentiate (LCSLT), and (6) Fellowship, by nomination.

Some 1,000 persons take the C.S.L.T. examinations each year.

Training programs are largely in cooperative training schools, conducted by groups of hospitals in various cities. There are a few institutes whose programs include not only medical technology but also other paramedical programs. And there are two degree courses connected with provincial universities. No credit-by-examination arrangements are in operation, although there has been some thought given to this subject.

In Great Britain, the terms technologist and technician are used interchangeably. The standards are uniform throughout the British Isles for those employed in laboratories which fall within the National Health Service. The system amounts to a career ladder as clearly designed as any to be found. Information about it was furnished by W. H. Valentine, O.B.E., F.I.M.L.T.

The beginning rung on the ladder is for the Student Medical Laboratory Technician, who receives three years of training and experience in the laboratory, circulating through the various specialties. Success in the Intermediate examination of the Institute of Medical Laboratory Technology enables him to become a Junior Medical Laboratory Technician, who specializes in one of the disciplines for two years. He may then take the "final" examination of the I.M.L.T. in that discipline. Success on that test entitles him to Associateship in the I.M.L.T. and to automatic promotion to the basic grade, Medical Laboratory Technician. Both the Intermediate examination and the Associate examination are in three parts, written, oral and practical.

The four grades above the basic one -- Senior I, Senior II, Chief I and Chief II -- are open to those who have obtained Fellowship of the I.M.L.T. by further written and oral examination two years after the Associateship examination.

A recent development, according to Mr. Valentine, that is gradually making changes in the training up to the basic grade has been a collaborative effort of the I.M.L.T. and the Department of Education and Science "in producing special variants of the Ordinary and Higher National Certificates in Sciences." He continues:

> These are long-established nationally recognized diplomas--each requiring two years of study--and the new variants are orientated to medical laboratory practice. Their educational content ensures a good foundation in chemistry, physics and mathematics. To attend these courses, students and juniors are given day release or "block" release from their laboratories. This newer system will, over the next two or three years, entirely replace the intermediate and qualifying examinations of the I.M.L.T. but will not affect the need for technicians to go on to fellowship level if they are to progress to the more senior positions.
>
> Among the advantages of the National Certificate scheme is that the holder of a High National Certificate may utilize it, if he is ambitious, as a means of proceeding with further study, to a science degree or equivalent. He could then migrate to the 'scientist' category either inside or outside of the National Health Service.

In Sweden, public health officials are "very interested in facilitating the upward mobility of health personnel," according to Majsa Andredd of the Swedish National Board of Health and Welfare, who goes on to say:

> "It is a general trend in our present educational program to make it possible for people with a certain education to get a shortened higher education by getting credits for knowledge already obtained. Within the health field this is put into system specifically within the field of nursing. We can however so far give no examples from the laboratory field."

The need to facilitate upward mobility for laboratory workers is not confined to the United States, then, but is felt in other nations as well.

LABORATORY DIRECTORS' ACTUAL HIRING PRACTICES

In practice, it appears that laboratory directors use all sorts of procedures to insure they are hiring the best available personnel for the job, whether they be regular personnel or moonlighting military laboratory technicians.

Some rely on certification, others on education and experience, and others on recommendations from references in the initial hiring of laboratory workers.

Most of those queried in an informal survey said they appoint people on a probationary basis, ranging from a few days to as long as six months, during which time the new worker must check out in the various laboratory areas in which he will be working. The purpose of this check-out is often twofold: both to train the new worker in the various idiosyncracies of the individual laboratory's work, and to observe and evaluate his competence and assess his potential contribution to the laboratory. This is in essence a rather long comprehensive "work sample" in a situation of less pressure than occurs during a one-shot examination. There is little attempt at either objectivity or standardization in such long-term testing, of course.

APPENDIX

Attachment 1
(See page 1)

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REGISTRY OF MEDICAL TECHNOLOGISTS

AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS

BALL MEMORIAL HOSPITAL

MUNCIE, INDIANA

Memorandum, Spring 1944 Examination of Candidates for Registration

A few pathologists noted when they accepted the office of examiner that they might be called for military or naval service before April 28. If you are called before the examination takes place, will you please arrange, if possible, for a capable examiner in your locality to conduct the examination at your laboratory.

Examiners will recall that the examination of candidates for registration is based only on the written and practical examinations, equal value being given to each. It is important, therefore, that every effort be exerted to make these examinations as informative as possible of the candidates' knowledge. In order to make the examinations still more useful this memorandum is being sent to each examiner in an effort to standardize as far as possible the methods which are used in the various parts of the country. It is the hope of the Board of Registry that these notes also may be helpful in making the task of the examiners easier.

The Board of Registry will be very grateful for any comments, criticisms, or suggestions that are received from the examiners, so please feel free to send any suggestions that occur to you in the course of these examinations.

A passing grade is required on both the written examination and the practical examination.

EXAMINERS' NOTES REGARDING THE PRACTICAL PAPER

It is suggested that various sections of the practical examination could well be conducted by technologists who either are registered or whose training and experience fully qualify them, and that at the close of each section a definite rating should be recorded by the individual conducting that portion of the examination.

The final summary of each practical examination should be recorded and summarized by the pathologist conducting the examination.

It is desired that the practical examination shall adhere as closely as possible to the outline of questions. Substitute or alternate methods are undesirable, but when absolutely necessary the procedure followed should be recorded. In the interest of standardization it is requested that no questions be asked the candidate in addition to those actually on the examination except where substitute questions are necessary.

Written tests may be held simultaneously with the practical examination, but allowance should be made for the additional time required for the latter.

The applicant is to be graded according to the following scale at the close of each section:

90 to 100% — excellent
80 to 90% — good
70 to 80% — fair
below 70% — poor, not passing

The entire practical examination sheet with ratings and with any comments from the examiner is to be returned with the written examination to the Registry office.

Ratings for each section of the examination should be based on:

1. Skill and accuracy in manipulation.
2. Knowledge of procedure, including apparatus involved.
3. Neatness and asepsis in technic.
4. Reasonable speed.
5. Thoroughness in observation.

In setting these questions, consideration has been given to the saving of expense and trouble for the examiner and his staff. Used material may be substituted for fresh material wherever it is feasible.

Section 1. A. Any specimen of feces may be used. The candidate should show an appreciation of the fact that the primary cultures are only the first step, and have a reasonable idea of the subsequent steps, in the isolation of pathogenic bacteria from the stool.

Section 1. B. This question is intended not only to test the candidates' ability to recognize bacteria under the microscope but to elicit the fact that there are limitations to how far an identification may be carried on the basis of morphology alone. Part 2 of the question is simply an extension of the test of their ability to follow up bacterial identification. If smears of the particular organisms are not available, any other bacteria of similar morphology may be used. For example, if Neisseria catarrhalis cannot be obtained, use a smear of urethral pus from a case of gonorrhea.

Section 2. A. 2. Here as in other questions on sources of error (see Section 3.A.2., and B.2., Section 4.A.2., and Section 5.A.2.) an attempt should be made to test the candidates' ability to recognize sources of error and to differentiate between those which are preventable and those which are not, as well as to evaluate the relative importance of each. It is suggested that a candidate who describes less important sources of error and omits those of greater importance should be marked accordingly.

Section 3. A. 1. It is expected that even if candidates have learned to perform serologic tests other than those listed, they should be able to carry out one of these tests. In order to save material it is not necessary to prepare fresh antigen for this test.

Section 3. B. 1. Any two samples of blood may be used.

Section 4. A. If cerebrospinal fluid is not available, an aqueous solution of glucose of suitable concentration may be used.

Section 4. B. Artificial material may be used for this question also.

Section 4. B. 2. Here, as in Section 2.A.1., the candidate is asked to perform a common test, but an unexpected factor is introduced into the calculation as a test of arithmetical ability. A photoelectric colorimeter should NOT be used.

Section 5. B. An artificial urine sediment may be prepared for this section.

EXAMINERS' NOTES REGARDING THE WRITTEN PAPER

Questions 5, 7, 9. As in the past, some questions are composed of a number of short parts. These enable the examination to touch upon many aspects of the candidates' knowledge. It would be desirable for the examiners to encourage the candidates to write brief and concise answers to these as well as to the other questions on this paper. At the same time the candidates should be urged to make COMPLETE STATEMENTS.

Question 3. Here, as in the questions on sources of error in the practical examination, the candidates should be urged to select the MOST IMPORTANT sources of error.

April, 1944

REGISTRY OF MEDICAL TECHNOLOGISTS
IERICAN SOCIETY OF CLINICAL PATHOLOGISTS
BALL MEMORIAL HOSPITAL
MUNCIE, INDIANA

Name of Applicant _____

Name of Examiner _____,M.D.

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer ten questions *only*.)

1. Describe in detail the performance of a fractional gastric analysis.

2. List all the apparatus and other materials used in the conduct of TWO of the following procedures:
   1. Determination of blood group
   2. Kolmer complement fixation test for syphilis
   3. Blood carbon dioxide combining power

3. List in the order of their importance what you consider the TWO MOST IMPORTANT factors of error in each of the following procedures:
   1. Basal metabolic rate determination
   2. Determination of blood group
   3. Blood sedimentation rate measurement
   4. Phenolsulphonephthalein renal function test
   5. Thrombocyte enumeration

4. Describe a suitable method for the detection of INTRA-blood-group incompatibility (i.e. incompatibility when donor and patient are of the same group).

5. State the normal values for the following: (Choose TEN of the twelve)
   1. Cerebrospinal fluid glucose
   2. Blood hemoglobin (in grams)
   3. Cerebrospinal fluid chlorides (as NaCl)
   4. Urine urobilinogen
   5. Blood clotting time (test tube method)
   6. Erythrocyte sedimentation rate (name method used)
   7. Blood plasma chlorides (as NoCl)
   8. Blood serum bilirubin
   9. Blood serum protein
   10. Blood uric acid
   11. Blood cholesterol
   12. Semen spermatozoa count

6. State chief points of differentiation between:
   1. Blood serum and blood plasma
   2. Taenia solium and Taenia saginata
   3. Bence-Jones protein and albumin in the urine
   4. A megaloblast and a large lymphocyte in a fixed blood smear stained with Wright's stain
   5. Endamoeba histolytica and Endamoeba coli

7. Make a drawing at least an inch in greatest diameter of each of the following: Choose FIVE of the six.
   1. Ascaris lumbricoides (unfertilized ovum)
   2. Trichinella spiralis (cyst)
   3. Trichomonas vaginalis
   4. Necator americanus (ovum)
   5. Enterobius vermicularis (ovum)
   6. Diphyllobothrium latum (proglottis)

8. Describe in general terms the principles involved in the conduct of each of the following procedures: (Choose TWO of the three)

   Example: Carbon dioxide estimation in blood plasma:

   Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100 cc of blood plasma.

   1. Bromsulphthalein liver function test
   2. Total plasma proteins
   3. Erythrocyte fragility test

9. Define the following terms: (Choose TEN of the twelve)
   1. Specific gravity
   2. Macrogametocyte
   3. Thrombocytopenia
   4. Ketosis
   5. Diazo reaction
   6. Erythroblastemia
   7. Glycolysis
   8. Heterophile antibody
   9. Isohemagglutinin
   10. Isotonic
   11. Rh factor
   12. Agglutinogen

10. Describe in detail a method for the determination of blood prothrombin time.

11. Given:
   A. 1.27 liters of 95 per cent ethyl alcohol: What percentage solution would result if enough water were added to make two liters?
   B. 379 cubic centimeters of a 3.5 per cent solution of sodium chloride in water: How many liters of water will it be necessary to add to obtain an isotonic solution?

April, 1944

REGISTRY OF MEDICAL TECHNOLOGISTS
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS
BALL MEMORIAL HOSPITAL
MUNCIE, INDIANA

Name of Applicant ----------

Name of Examiner ----------,M.D.

PRACTICAL EXAMINATION

Section 1 — BACTERIOLOGY (100%)

Grade ..... %

A. Given a specimen of feces: (50%)
   1. Demonstrate the initial steps in making suitable cultures for the identification of possible pathogenic bacteria.
   2. Describe subsequent procedures which may be used in the further identification of the resultant cultures.

Grade %

B. Using properly prepared stained smears of each: (50%)
   1. Identify as far as possible the following:
      a. Escherichia coli
      b. Corynebacterium diphtheriae
      c. Diplococcus pneumoniae
      d. Neisseria catarrhalis
   2. Describe further steps in their identification.

Total Grade ..... %

Section 2 — HEMATOLOGY (100%)

A. 1. Perform an erythrocyte count drawing the blood to the 0.7 graduation on the pipette, and showing all calculations. (60%)

Grade ..... %

   2. Describe three important sources of error in the performance of an erythrocyte count and methods of avoiding them.

Grade ..... %

B. 1. Make a blood smear and stain it. (40%)
   2. Using this stained smear, point out four important requirements in making a suitable smear.

Total Grade ..... %

Section 3 — SEROLOGY (100%)

Grade ..... %

A. 1. Demonstrate in detail one of the following tests: (60%)
      a. Mazzini
      b. Kline
      c. Kolmer Wasserman
      d. Hinton
      e. Eagle
      f. Kahn
   2. Describe four important sources of error in the conduct of the test.

Grade .....%

B. 1. Cross-match the blood from two individuals. (40%)
   2. Point out the most important sources of error in this procedure.

Total Grade ..... %

Section 4 — BIOCHEMISTRY (100%)

Grade ..... %

A. Given a specimen of cerebrospinal fluid: (50%)
   1. Perform a quantitative estimation for glucose.
   2. Point out four important sources of error in the performance of this estimation and methods of avoiding each.

Grade ..... %

B. Given three specimens of urine collected at 20, 60 and 120 minutes after the dye injection in a phenolsulphonephthalein renal function test, and a statement of the appearance time: (50%)
   1. Make the necessary examinations and write out a report of the result of your examination.
   2. Use the colorimeter with the standard cup set at 5, and show all calculations.

Total Grade .....%

Section 5 — CLINICAL MICROSCOPY AND HISTOLOGIC TECHNIC (100%)

Grade ..... %

A. Using a tissue specimen mounted in a paraffin block: (70%)
   1. Cut and mount a section on a slide.
   2. Point out five possible reasons for defective sections and describe methods of avoiding each defect.

Grade ..... %

B. Given a specimen of urine: (30%)
   1. Identify five different structures in the centrifuged sediment.
   2. Test the specimen for the presence of bile.

Total Grade %

Attachment 2
(See page 7)

THE AMERICAN BOARD OF PATHOLOGY

Description of Examinations

For the benefit of those candidates who are not familiar with the objective, multiple-choice form of test, the Board has prepared samples of the more frequently used types of questions currently included in the written examinations. Candidates will find considerable advantage in studying the instructions accompanying these samples and in becoming familiar with the various types of questions.

The examination for each subject consists of a large number of questions, the number having been adjusted to the time allowance for the particular subject. Certain questions test the candidate's recognition of the similarity or dissimilarity of pathologic processes. Other questions evaluate the candidate's judgment as to the cause and effect, or the lack of casual relationships.

The most appropriate preparation for an examination of this kind is a thorough review of the subject rather than selective "cramming". The tests are designed to measure comprehensive knowledge and ability to apply that knowledge intelligently. Anyone suitably prepared in the various subjects should not have undue difficulty with these examinations.

In this type of examination no student is expected to obtain a perfect score. The best procedure is for the candidate to answer all questions about which he has any knowledge, since a well-considered choice is more often right than wrong. Haphazard guessing, however, is not advisable.

Many items will appear under each set of instructions in the examination. Thus, once the candidate has the specific instructions in mind, he will encounter a block of ten or twenty, or perhaps fifty items before meeting a new set of directions.

In these sample questions, as in the examination itself, there is always one and only one best answer. At the same time it must be recognized that in the broad field of pathology contrasts may not be sharply defined as between black and white but rather varying shades of gray. In answering these questions, therefore, one should look for the best choice and not be misled by other choices which might be considered possible, but still less applicable than the one considered correct.

SAMPLE QUESTIONS

Completion Items

Directions: Each of the following questions or incomplete statements is followed by five suggested answers or completions. Select the one which is best in each case and mark it on the answer sheet.

1. The initial pathologic process in puerperal infection is:

   A. Pelvic thrombophlebitis

   B. Endometritis

   C. Perimetritis

   D. Pelvic Peritonitis

   E. Salpingo-oophoritis

B. (+)

Classification Items

Directions: Each of the numbered words or phrases below is associated with one, both, or neither of the headings listed as A through D above it. On the answer sheet, place the appropriate letter for that word or phrase.

A - if the numbered phrase or word is associated with A only.
B - if the numbered phrase or word is associated with B only.
C - if the numbered phrase or word is associated with both.
D - if the numbered phrase or word is associated with neither.

A. Hepatoma
B. Hemangioma of liver
C. Both
D. Neither

1. Metastasis
2. Jaundice
3. Spongy appearance
4. Ascites
5. Decrease in size of liver
6. Cirrhosis

1. (A)
2. (A)
3. (B)
4. (A)
5. (D)
6. (A)

Quantitative Comparison Items

Directions: The following paired statements describe two entities which are to be compared in the quantitative sense. Place the appropriate letter of the following on the answer sheet:

A - if the entity described on the left is greater than that on the right.
B - if the entity described on the left is less than that on the right.
C - if the left and right are approximately the same.

Involvement of the brain in Rocky Mountain spotted fever.	Involvement of the brain in scrub typhus.	(A)

Correlation Items

Directions: In each of the following questions there are two parts - first, a list lettered with the alphabet and second, a numbered list. Place on the answer sheet the one item on the lettered list related to the numbered list.

A. Dermatropic viral disease
B. Viscerotropic viral disease
C. Neurotropic viral disease
D. Flat worm disease
E. Round worm disease

1. Mumps
2. Rabies
3. Cysticerciasis
4. Schistosomiasis
5. Echinococcosis

1. (B)
2. (C)
3. (D)
4. (D)
5. (D)

Variation Relations Items

Directions: Each of the following pairs of phrases describes conditions or quantities which may or may not be related. Place the appropriate letter of the following on the answer sheet:

A - if the increase in the first is accompanied by an increase in the second, or if decrease in the first is accompanied by decrease in the second.

B - if the increase in the first is accompanied by decrease in the second, or if the decrease in the first is accompanied by increase in the second.

C - if the second remains constant, or approximately the same when the first increases or decreases.

Ionized calcium in the blood after transfusion with citrated plasma. — Urinary excretion of calcium after transfusion with citrated plasma. (B)

Cause and Effect Items

Directions: Each of the following sentences consists of two main parts - a statement and a reason for that statement. On the answer sheet place the appropriate letters as follows:

A - if both the statement and the reason are true and are related as to cause and effect.
B - if both the statement and the reason are true but are not related as to cause and effect.
C - if the statement is true but the reason is false.
D - if the statement is false but the reason is an accepted fact or principle.
E - if both the statement and the reason are false.

1. The elevation of uric acid in the blood is the primary cause of gout because all of the conditions in which there is uricacidemia are significantly associated with gout. 1. (E)

2. The incubation period of homologous serum jaundice and epidemic hepatitis are the same because pathologic changes are identical. 2. (D)

Attachment 2, continued

Chronologic Comparison Items

Directions: Each of the following pairs of phrases describes two occurrences which are to be placed in the proper sequence in time. On the answer sheet place the appropriate letter of the following:

A - if the occurrence on the left takes places before the occurrence on the right.

B - if the occurrence on the left takes place after the occurrence on the right.

C - if the occurrence on the left takes place at approximately the same time as the occurrence on the right.

1.	Glomerular destruction in ascending pyelonephritis.	Tubular destruction in ascending pyelonephritis.	1. (B)
2.	Platelet deposition in thrombi.	Coagulation of plasma in thrombi.	2. (A)

Multiple Completion Items

Directions: For each of the incomplete statements below, one or more of the completions is/are correct. Decide which completion or completions is/are correct and place the appropriate letter on the answer sheet, using:

A - if only 1, 2 and 3 are correct.
B - if only 1 and 3 are correct.
C - if only 2 and 4 are correct.
D - if only 4 is correct.
E - if some other completion or combination of completions of those given is/are correct.

Lobar pneumonia is:

1. Usually caused by the Pneumococcus.
2. Rarely encountered in white females.
3. Characterized by an intra-alveolar exudate which is rich in fibrin.
4. Usually confined to the lower lobes.

(B)

SAMPLE QUESTIONS
PHS-Sponsored Examination for Certain Directors
of Independent Laboratories

1. A cell <u>not</u> ordinarily found in the normal human peripheral blood is the:

   a. plasmocyte
   b. lymphocyte
   c. thrombocyte
   d. erythrocyte
   e. leukocyte

2. In blood chemistry determinations, controls should be run:

   a. when a colorimeter is replaced
   b. once a month
   c. once a year
   d. when new reagents are used
   e. every time the procedure is used

3. In most serological procedures the serum under test is usually heated to $56^{o}C$ for 30 minutes before use primarily in order to:

   a. destroy all viruses
   b. get rid of nonspecific inhibitors
   c. destroy the complement in the serum
   d. sterilize the preparation
   e. enhance the activity of the antibody

4. The simplest and most rapid method for determining antibiotic susceptibility of microorganisms is the:

   a. agar disc diffusion method
   b. tube dilution method
   c. plate dilution method
   d. animal inoculation method
   e. hemolysis inhibition method

5. When a strong alkali gets in the eye, the recognized first-aid treatment is to:

   a. give the eye a preliminary rinsing with dilute acetic acid solution to neutralize the alkali
   b. flush the eye immediately with copious amounts of water
   c. apply petrolatum jelly immediately and get the patient to the doctor
   d. wash out the eye first with 1% sodium bicarbonate solution
   e. take the victim immediately to the doctor without losing precious time for first-aid.

Correct Answers:
1a, 2e, 3c, 4a, 5b

Attachment 4
(See page 16)

STATE OF ILLINOIS DEPARTMENT OF PERSONNEL
INSTRUCTIONS TO PERFORMANCE TEST EXAMINERS FOR
LABORATORY TECHNICIAN I & II

The purpose of the performance test is to evaluate an applicant's suitability for laboratory work in the particular option as to his personal qualities and ability to perform the work. The test is not intended to evaluate per se the training and experience or general technical knowledge of the applicant. The performance test is an eliminating part of the examination for Laboratory Technician I and II. If an applicant does not receive a grade of 70 or above on the performance test, he is disqualified for the position for that particular time. In addition to the performance test, the examination also consists of a written test and an evaluation of training and experience. All applicants will have passed the written test before being scheduled for the performance test and the evaluation of training and experience will be conducted by the Department of Personnel for successful applicants after the performance test has been given.

Each applicant will be interviewed in the laboratory by the interview board. Only one applicant should be interviewed at one time. At the time of the test, other laboratory personnel should be absent or at least not in close proximity to the examining board and applicant. The suggested time limit for each test is 20 minutes. It is especially important that applicants be evaluated against specific job requirements. That is, it is not the applicant's "self-expression in general" or his "mental alertness in all situations" which are being evaluated, but rather his self-expression, mental alertness etc., insofar as they will be an asset or a liability to him in the position for which he is applying. Every effort should be made to insure uniform standards when rating applicants for the same position title. In order to insure uniformity in the test, the attached suggested questions and problems are to be used. The interviewers may use other questions so long as they are consistent with the central type and thought of the attached questions.

Attachment 4, continued

Performance Test Procedure

1. You should use a separate rating sheet for each option as a separate performance test should be given for each option. That is, if an applicant is applying for Laboratory Technician I, options 1 and 2, each rater will fill out two sheets for the applicant. If the applicant is applying for both Laboratory Technician I & II-Option 1 only one sheet need be filled out.

2. Each rater should fill in all the information requested at the top of the rating sheet.

3. It is on ly necessary to check (1/) the appropriate boxes on the form for each area to be evaluated for the particular position. There should be only one box checked for each area. Be sure to check in the appropriate box as to the title for which the applicant is applying and for which you are rating. The numerical ratings are included on the sheet for your information. As will be noted, a rating of average in all sections will give an applicant a grade of 70. Normally, the examining board will consist of two members. Each member will fill out an oral sheet for each applicant. The oral grade of the applicant is an average of the board members individual ratings.

4. You should use the indelible pencil in marking your ratings. If you wish to change your rating, mark through that rating and intial your new rating.

5. Although care will be taken in advance to ascertain whether examiners will be acquainted with the applicants, you should excuse yourself from the test if any of the following apply:

   a. If you feel your rating will be biased.
   b. If the candidate might feel you would influence the other members of the board.

6. In rating the applicant, it is important for each interviewer to note the following:

   a. If an interviewer fails an applicant, it is necessary to make specific comments on the rating sheet as to why the applicant appears to be unsuitable.

   b. If an applicant's average test grade is below 70 although one member of the board has passed him (this may occur when one member rates low enough to bring the average below 70) or if the reverse is true, i.e. applicant passes although one member fails him, it is necessary for the board to reach a majority opinion. It is hardly justifiable to fail or pass an applicant if a majority is not reached.

   c. It is also hardly justifiable that an applicant would be given a grade below 70 by an interviewer, if the applicant has been rated as average or above in the overall evaluation.

   d. Rating in relation to the requirements of the positions is particularly important when rating a candidate applying for more than one level. Care should be taken to avoid any illogical results, such as, an applicant receiving a higher grade for Laboratory Technician II than for Laboratory Technician I. For example, it is logical to assume that the appli-

cant's rating on Overall Evaluation may be good for Laboratory Technician I, but average for Laboratory Technician II.

7. IMPORTANT NOTE: Applicants should not be informed of their performance grade after they have taken the test. The papers will be checked in Springfield and the applicants will be notified of their final average grades (average of written, performance, and training and experience) as soon as scoring and processing is completed.

Every effort should be made to limit the performance test to 20 minutes, however in order to maintain uniformity, the test should not be less than 20 minutes. Grant each applicant as fair and complete an examination as any other applicant, even if he appears obviously unsuited for the position.

Each applicant should be rated in relation to the requirements of the job for which he has applied. Definitions of each trait, or personality factor, are given below to provide you with well-defined and objective standards. By using these definitions to gain an understanding of each trait, each board will be rating applicants by the same standards.

PERSONAL QUALITIES

Does the applicant understand fully each question or situation as it is first presented to him or is it necessary to repeat and explain the question? Does he usually grasp the more subtle points? Does the applicant present his ideas clearly without being unduly wordy or does he sound confused and illogical? Does his choice of words indicate an understanding of laboratory terminology? Is he suited tempermentally and by appearance and manner to work in a research and laboratory environment? Does he exhibit qualities which would be beneficial in work which is exacting and tedious or does he appear that in work of this nature he would lose patience and become careless?

JOB KNOWLEDGE

Does the applicant have a knowledge of the specialized area for which he is applying?

PRACTICAL APPLICATION

Does the applicant exhibit the deftness required in handling laboratory equipment or is he awkward and careless in his actions? Are his movements coordi-

nated and exact or are they uncoordinated? Does the candidate appear to be familiar with and recognize the necessity for exactitude and dexterity in handling laboratory equipment? Does the applicant have the necessary understanding of the specialized equipment used for this option? Does he appear to be familiar with the handling of this equipment?

OVERALL EVALUATION

On the basis of your above evaluations of the applicant, what is your overall opinion of this candidate? Would you hire him to work for you in this capacity? Would he be an asset in a laboratory or would his services be detrimental?

Attachment 4, continued

State of Illinois
DEPARTMENT OF PERSONNEL
Springfield, Illinois

SPECIALIZED PERFORMANCE RATING SHEET	LABORATORY TECHNICIAN I & II OPTION _____	I.D. Number _____ Date _____ Rater _____

To the Rater: Please note carefully the instructions on the reverse side.

		Out-standing	Good	Aver-age	Poor	Very Poor	I	II
PERSONAL QUALITIES: Is the applicant quick to grasp and understand a question or situation? Does the applicant express himself clearly and adequately? Does the applicant appear to have reasonable control over his emotions or is he touchy and easily upset?	I	15	13	11	9	7		
	II	13	11	9	7	5		
JOB KNOWLEDGE: (Based upon answers to oral questions) Does the applicant have an adequate grasp of the technical area in the option for which he is applying?	I	15	13	11	9	7		
	II	13	11	9	7	5		
PRACTICAL APPLICATION: (Based upon the applicant's identification and description of the use of equipment and his practical demonstration.) Does the applicant have an adequate grasp of the equipment required for this position? Does the applicant exhibit the manual dexterity to work effectively in a laboratory?	I	33	28	23	18	13		
	II	35	30	25	20	15		
OVERALL EVALUATION: On the basis of this test, what kind of employee would this applicant make in this position?	I	37	31	25	19	13		
	II	39	33	27	21	15		
		100	85	70	55	40	TOTAL - - - - AV.	TOTAL - - - - AV.

COMMENTS:

Quest. nos. asked:

DP-77 (4-61)

Attachment 5. Draft Examination for Retrained Medical Technologists
(See page 24)

STUDENT EVALUATION

NAME: _____

DEPARTMENT: _____ FROM: _____ TO: _____

NO. OF DAYS ABSENT: _____ REASON FOR ABSENCE: _____

TARDINESS: NEVER _____ SELDOM _____ OFTEN _____

RATINGS:

ACCURACY: Consider record of technical performance.
_____ Is consistently accurate.
_____ Makes very occasional errors.
_____ Work generally acceptable.
_____ Makes repeated mistakes.

UNDERSTANDING OF WORK: Consider coordination of practical application and theory, reasoning ability, intelligence.
_____ Superior.
_____ Good.
_____ Adequate.
_____ Lacks grasp of basic principles.

ORGANIZATION OF WORK: Consider inventiveness and imagination in carrying out assignments, general management and use of time.
_____ Superior.
_____ Good.
_____ Adequate or acceptable.
_____ Has to be told in detail what to do.

PROGRESS: Consider gain in self-confidence, improvement in speed, perseverance, effort.
_____ Shows exceptional progress or is a naturally quick and confident worker.
_____ Marked or steady improvement.
_____ Acceptable progress.
_____ Indifferent attitude toward improvement, does not work to extent of ability.

JUDGMENT AND COMMON SENSE: Consider ability and foresight in handling situations tactfully and making decisions in everyday work.
_____ Sound decisions.
_____ Fair deductions.
_____ Poor.
_____ Lacks ability to make decisions.
_____ Lacks mathematical ability.

Attachment 5, continued

INITIATIVE: Consider ability to see things to do, resourcefulness, independence, achievement, imagination.

_____ Does additional unsolicited work, has scientific curiosity.
_____ Does assigned work well. Seeks additional work if time available.
_____ Does only assigned work or work that is interesting.
_____ Needs prodding, lazy.

MANUAL DEXTERITY: Consider awkwardness, pipetting technique, ease of using mechanical devices.

_____ Generally good technique or natural aptitude.
_____ Steady improvement in technique.
_____ Awkward but acceptable.
_____ Never mastered techniques.

COOPERATION: Consider willingness to work with people in varicus capacities, loyalty, adaptability.

_____ Always very cooperative with everyone.
_____ Cooperative only with supervisor.
_____ Usually cooperative.
_____ Never cooperative.

EMOTIONS: Consider reactions in various situations when stress is likely, personal adjustment, maturity.

_____ Well-balanced, adjusts well to different situations.
_____ Easily depressed or elated.
_____ Excitable, handles emergency situations poorly.
_____ Unresponsive.

PERSONALITY: Consider mannerism and appearance, general impression on others, spontaneity.

_____ Well liked by everyone.
_____ Quiet, self-sufficient, pleasant.
_____ Hard to know, shy, aloof, withdrawn.
_____ Unpleasant, hard to work with.
_____ Antagonistic, resents authority.

ATTITUDES: Consider interest in profession, motivation, sincerity, participation.

_____ Enthusiastic about her work.
_____ Personal satisfaction from profession.
_____ Indifferent.
_____ Critical in destructive sense, defensive, complaining.

POTENTIALITIES: Consider possibilities in future employment, fitness for profession, latent abilities.

_____ Will make an excellent medical technologist.
_____ Will do well but not outstanding.
_____ Works best under supervision and direction.
_____ Has minimal aptitude and interest.
_____ Lacks confidence.

Attachment 5, continued

PERSONAL APPEARANCE: Consider cleanliness, neatness, posture, and carriage.

_____ Exceptionally neat and well-groomed.
_____ Usually neat.
_____ Tends to neglect personal appearance.
_____ Wears too much make-up.
_____ Does not conform to conservative professional standards.

SELF-KNOWLEDGE: Consider the student's insight regarding own professional limitations, willingness to learn from suggestions and criticism.

_____ Has good insight into own limitations and makes sincere effort to learn. Shows positive attitude toward suggestions and criticism.
_____ Occasionally lacks awareness of limitations. Usually willing to learn and able to accept suggestions.
_____ Unaware of own limitations, tends to ignore suggestions and criticism.
_____ Does not utilize opportunities to practice skills in which sufficient competency has not been achieved.

ASSUMES RESPONSIBILITIES THAT ARE HERS AS A PROFESSIONAL: Consider the following: Conducts self in a manner acceptable for a professional person, maintains professional appearance, maintains confidences, keeps the welfare of the patient uppormost in mind, uses judgment in seeking assistance, shares responsibilities within her group.

_____ Conducts herself professionally at all times.
_____ Usually conducts herself as a professional person.
_____ Does not conduct herself as a professional person.

Has this student completed the work in your laboratory to your satisfaction?_____

Do you feel that she should repeat her period of training in your laboratory?_____

Would you hire her for your department?_____

PROGRAMMED TESTING
BACTERIOLOGY

Instructions

Study the initial information and list of possible courses in problem 1. Select as many actions, in any sequence, as you consider indicated in problem 1 and erase the blue rectangle directly opposite each choice. Keeping in mind the information thus obtained, proceed in a similar manner with problem 2 and then with problem 3.

After completing all three problems, erase the answer key (square block at right). "Yes" indicates a correct procedure, "No" an incorrect one, and "0" a procedure unimportant to the solution of the problem. Count (1) the errors of commission, i.e., all choices resulting in "No"; (2) the errors of omission, i.e., all failures to choose actions resulting in "Yes". After scoring yourself, all rectangular blocks may be erased to disclose the results of choices not selected.

Problem 1

A cloudy spinal fluid arrives for culture, but completion of a STAT request prevents immediate processing of the fluid. You should:

1. Leave the spinal fluid at room temperature.
2. Refrigerate the specimen
3. Incubate at 37°C

Problem 2

After processing the fluid, you find no organisms revealed in smears. You should innoculate with:

1. Trypticase soy broth	No anerobe growth	No
2. Chocolate Agar and SS Agar	SS inhibits organisms	No
3. Thioglycollate broth, Chocolate Agar and Blood Sugar	Rapid growth in 10 pc. CO_2	Yes
4. Thioglycollate broth	Incomplete	Yes

Problem 3

A gram stain of the growth reveals gram negative bacilli, allowing identification of:

1.	E. Coli	Not pleomorphic	No
2.	Hemophilus influenzae	Organism found	Yes
3.	Neisseria meningitidis	Gram negative, coccus	No
4.	Listeria monocytogenes	Gram positive	No

Attachment 6
(See page 60)

HIGHLIGHTS from a Ph.D. thesis by Col. James J. Young, Office of the Surgeon General, Department of the Army
"FORMER SERVICEMEN OF THE ARMY MEDICAL DEPARTMENT: A Profile and Assessment of an Untapped Resource of Allied Health Manpower," University of Iowa, 1969

Col. Young sampled the backgrounds and opinions of 1,558 men separated from the Army Medical Corps to the reserve in 1968. These men were representative of approximately 21,000 medical corpsmen released to the reserve in that year.

The sampling does not include men with more than six years' service, women coming out of the WAC, or, of course, medical corpsmen from the Navy and Air Force.

The respondents were grouped according to amount of training. Stratum I included those with 10 weeks or less of training. Stratum II, those with 11-20 weeks. Stratum III, those with 21 weeks or more.

The medical laboratory specialists included in the survey were mainly in S-II - 274 out of approximately 1,000 released in 1968 to the reserve. There were 16 S-III medical laboratory specialists responding out of 34 released in 1968. Since the vast majority of laboratory personnel responding were in S-II, information on this stratum is emphasized in the highlights below. (There were no laboratory personnel in S-I.)

****

A comparison of laboratory personnel released against the needs for optimum care* and the numbers coming from civilian sub-baccalaureate programs in 1967#:

MOS	Released 1968 to Reserve	Additional Needs/1966*	1967 Civilian Trainees#
92B2 medical laboratory specialists (S-II)	1,000	2,500	1,100
92B3 medical laboratory specialists (S-III)	34	9,272	1,344

*from Manpower Resources in Hospitals - 1966, a report of a survey of the Bureau of Health Manpower, Public Health service, and the American Hospital Association

#from Report to the President and the Congress on the Allied Health Professions Personnel Training Act of 1966, As Amended, by the U.S. Department of Health Education and Welfare, National Institutes of Health, Bureau of Health Professions Education and Manpower Training, Division of Allied Health Manpower, April 29, 1969

****

70% of the respondents in S-II and 45% of those in S-III have had one or more years of college.

Those surveyed evidenced a high level of satisfaction with their MOS. They are apparently favorably disposed to health occupations, at least in the military environment. Less than 5% of S-II and S-III were dissatisfied.

The percentage rating their military training as excellent to good increases progressively: S-I, 62%; S-II, 76%; S-III, 79%

****

The majority had at least one year experience on the job following training. The inference is that some 14,000 men annually separated from the Army Medical Corps have received paramedical training and a minimum of one year experience in their MOS.

****

Most are not working in health occupations:

	S-I	S-II	S-III
working in health fields	8%	24%	25%
working in other fields	77	60	61
not working	14	16	14

Those with the least amount of training were the least likely to be working in civilian health fields.

Of the 249 laboratory specialists answering, 34.5% were working in health fields. The inference is that about 345 of all laboratory specialists separated in 1968 are so employed.

****

Various barriers to employment in the civilian health fields were cited. For S-II, here are the figures:

	Cited by those who sought health employment	Cited by those who didn't seek health employment
Cannot meet certification requirements	53%	45%
Military training not recognized	50%	31%
Doesn't have necessary education	48%	51%
Must work beneath level of experience	40%	26%
Pay and fringe benefits too low	35%	65%

Evidence tends to deny any wage disparity among health and non-health occupations entered by those in S-II and S-III.

Here are the monthly wages of those in S-II not presently employed in health occupations they say it would take to attract them:

$ 250 - 350	0.2%
351 - 400	2.0
401 - 500	7.2
501 - 550	10.0
551 - 600	14.9
601 - 700	22.3
700 plus	33.1
wouldn't consider	10.2

35% of laboratory specialists would be attracted at up to $600 a month.

****

19.1% of S-II have attended or are attending school for a health career.

****

Would you attend junior college if advanced standing were offered?

Of S-II, 35% said definitely, 24% said probably, and 30% already have two years of college. The inference is that approximately 3,050 former servicemen annually might be attracted to civilian health occupations if given the opportunity to complete their education in less time than someone without similar training and experience.

****

Would you take an equivalency examination for educational purposes? Of S-II, 83.9% yes.

Would you take an equivalency examination for job placement? Of S-II, 78.1% said yes.

BIBLIOGRAPHY

A: Health Manpower and Career Mobility

B: Mobility and Testing in the Medical Laboratory Field

C: Testing in Health Professions

D: Testing Nurses

E: Granting Academic Credit by Examination

F: Transfer from Military to Civilian Health Fields

G: Licensure and Other Governmental Regulations

H: Testing in Education and Industrial Fields

I: Testing--General References

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A. HEALTH MANPOWER AND CAREER MOBILITY

1. Duffy, Gordon W., A Legislator Looks at Health Manpower. Paper read at an Allied Health Conference sponsored by the California Board of Medical Examiners, July 1968.

Mr. Duffy, a member of the California state legislature, deals with the need to break down the barriers to upward mobility in the health professions, and to put an end to requirements that persons wishing to move upwards begin a formal educational process anew without receiving much, if any, credit for their former education or experience. "The proven ability to perform is of as much if not more value to an employer and to society as is the potential ability to perform which is evidenced by a diploma or certificate or license."

2. Education for the Allied Health Professions and Services. Washington: U.S. Department of Health, Education, and Welfare, 1967.

This report of the Allied Health Professions Education Subcommittee of the National Advisory Health Council spells out health manpower supply and needs, analyzes the programs for education and training for allied health occupations and their output of trained personnel, and discusses the needs for new programs. On the establishment of career ladders and equivalency examinations: "While it is desirable to have certain courses in a junior college accepted for credit in a senior college, it is perhaps more important to adopt the principle of credit for attainment in a field which could be tested by examination. There should be less concern for formal course requirements, and more for grasp of knowledge and skill. Programs should be designed to facilitate progress from the technical to the more advanced levels of education and practice in the health occupations."

3. Horowitz , Morris A., and Goldstein, Harold M., Hiring Standards for Paramedical Manpower. Boston: Northeastern University, Sept. 1968.

This is a report to the Manpower Administration of the U.S. Department of Labor.

Having studied the job descriptions and personal qualifications of 524 workers in 22 paramedical occupations in hospitals in the Boston area, the authors report that persons with widely differing educational and professional backgrounds are doing the same or similar paramedical tasks. There were slight, if any differences between laboratory technologists and laboratory technicians in distribution of their work time among various functions.

Among the recommendations in this study: Hospitals should re-examine paramedical occupational structure to determine job requirements, and establish hiring standards relevant to functions to be performed. Arbitrary licensing and educational requirements that are not needed for satisfactory performance should be

eliminated. Hospitals should coordinate hiring standards at the minimum to provide necessary quality while using the educationally disadvantaged, and should develop promotion ladders with on-the-job training available.

4. Kadish, Joseph, "Career Mobility in the Allied Health Occupations," Proceedings of Symposium on Paramedical Education and Career Mobility. Chicago: Illinois Regional Medical Program, 1968.

A review of the need for optimal use of health manpower, and of the issues related to career mobility: balance between generic and specific training, the development of core courses, opportunity for continuing education, the need for task analyses, development of new careers, and advancement upward through part-time study. Of equivalency tests, the author says: "Equivalency examinations have far-reaching implications for the health occupations and for unlocking dead-end careers and establishing new career ladders."

5. Kissick, William L., "Effective Utilization: The Critical Factor in Health Manpower," American Journal of Public Health, Vol. 58, No. 1, Jan. 1968, pp. 23-29.

A discussion of approaches to improved utilization of personnel in the health professions: (1) downward transfer of functions, (2) new educational programs, using a "theory-skill" continuum in which there are academic and experience equivalents common to several levels of functioning, (3) improved lateral and vertical career mobility, and (4) application of technology.

6. Light, Israel, "Development and Growth of New Allied Health Fields," J.A.M.A., Vol. 210, No. 1, Oct. 6, 1969, pp. 114-120.

This paper was read before the 65th annual Congress on Medical Education sponsored by the AMA Council on Medical Education.

In discussing the problems involved in setting up new categories of health occupations, Dr. Light makes the point that a major roadblock to efficient utilization of health personnel is the "long-standing tradition of educational institutions, professional societies, and employers to equate potential for quality performance with educational achievement." He indicates that task analysis makes it possible to identify required levels of performance, and that equivalency examinations can make mobility possible from one level to the next and beyond.

7. Moxley, John H. III, "The Predicament in Health Manpower," American Journal of Nursing, Vol. 68, No. 7, July 1968, pp.1486-90.

A review of the 1967 and 1968 Reports of the National Advisory Commission on Health Manpower, and especially of the Commission's Education Panel, assessing the national problem of lack of health personnel. The panel recommended that a national uniform licensing code be developed for each category of health manpower which requires licensure, and that entrance to the licensing examination be determined by the applicant's school rather than by rigid educational and experience requirements calculated on a "time-served" scale. The universities should take over the responsibility for providing proper mix of educational programs -- including those without degree requirements -- to meet the demands of applicants and the health fields. Such programs would involve the core curriculum idea, as well as advanced placement on the basis of demonstrated knowledge.

8. Perry, J. Warren, "Career Mobility in Allied Health Education," J.A.M.A., Vol. 21, No. 1, Oct. 6, 1969, pp. 107-110.

This paper was read before the 65th annual Congress on Medical Education sponsored by the AMA Council on Medical Education. Dr. Perry was at that time President of the Association of Schools of Allied Health Professions. He cites the following factors needed for career mobility to become a reality: (1) a thorough job analysis in each allied health program, (2) design of educational programs with statements of objectives and evaluation of role, functions and duties to match the prepared job analyses, (3) development of "core" curricula, (4) development of equivalency testing programs by which off-campus learning can be evaluated and offered credit toward college and university work, (5) lowering of the barriers between and among associations and agencies, and (6) a working relationship between the associate degree and certificate programs and the baccalaureate and graduate programs for the allied health professions.

9. Personnel Qualifications for Medicare Personnel: A Report to Congress. Washington, Department of Health, Education, and Welfare, Dec. 1968.

The findings of a panel in regard to standards for paramedical personnel covered by provisions of the Medicare Program.

Generally, Medicare regulations go beyond the usual tests of qualifications by providing that individuals meeting alternative training and experience requirements may be found to be qualified personnel. At the same time, the quality of health care services is of paramount importance.

Changes were recommended in the regulations covering physical therapists and medical record personnel, in view of the particular shortages in these positions. For the former, a proficiency examination is being developed to allow certain physical therapists to qualify if they can demonstrate competence, despite their lack of the required education and/or experience. For the latter, standards will be modified.

Among the fields recommending no change in Medicare regulations was that of Independent Laboratory Personnel since, the panel said, "the current regulations represent the minimal acceptable level of standards to assure safe laboratory performance."

10. Phillips, Charles W., Scudder, Harvey I., and Kramer, Lucy M., "Job Development and Training for Workers in Health Services," Health, Education and Welfare Indicators, August 1966.

A report of a conference jointly sponsored by the Departments of Labor and of Health. Education and Welfare, and including representatives of labor, management, education, health organizations, government, professional associations, and other interested groups Among the recommendations: "That job ladders and opportunities for career advancement be provided for qualified workers in health services....The upgrading of personnel already employed is both the most efficient method of getting the next higher level of technical aid, and the quickest way to open up entry-level jobs for new recruits into the field."

11. Randal, Judith, "Ladders to Health Careers Needed," Washington Evening Star, Oct. 30, 1969

This editorial page article states the need for new categories of assistants in the health field, and for upward mobility. The writer insists that doctors must not resist moves in this direction, since the public "is going to insist that top-flight people be attracted to paramedical careers....and more people will lean toward governmental intervention."

12. Report to the President and the Congress on the Allied Health Professions Personnel Training Act of 1966, as Amended. Washington: U.S. Department of Health, Education, and Welfare, 1969.

Prepared in the Division of Allied Health Manpower, Bureau of Health Professions Education and Manpower Training, National Institutes of Health, this report provides information on programs funded through the Act. It charts health manpower requirements and probable supply. And it gives the views of the Secretary of Health, Education, and Welfare as to the manpower education and training needs, including a very strong advocacy of equivalency examinations and advanced placement recognizing knowledge and skills attained outside formal educational programs.

13. Training Health Service Workers: The Critical Challenge. Washington: U.S. Department of Labor and U.S. Department of Health, Education, and Welfare, 1966.

The report of the proceedings of a Conference on Job Development and Training for Workers in Health Services. This is an overview of health manpower needs. Among the suggestions for increasing the quantity and quality of health workers was "creating job ladders and providing upgrading opportunities for qualified workers in health services." In his discussion of trends in education and training of

health service workers, Robert E. Kinsinger, one of the speakers, reviewed the progress of the New York College Proficiency Examination Program and the establishment of the Council on College-Level Examinations as new approaches which may make it possible for colleges "to grant advanced standing to health workers who have received their initial training in other than collegiage institutions."

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14. Baxter, Sister Marguerite, O.S.B., "Getting More from Laboratory Manpower and Equipment," Hospital Progress, Vol. 48, No. 1, Jan. 1967, pp. 80-86.

The author indicates laboratories must recognize a realistic relationship between job requirements and educational background, using a diversity of personnel with a range of skills.

15. Bierman, Pearl, Myers, Beverlee A., Rodak, John, and Reibel, Jay S., M.D., "Certifying Independent Laboratories Under Medicare," Public Health Reports, Vol. 83, No. 9, Sept. 1968, pp. 731-739.

A description of the development of an examination for certain directors of independent laboratories whose education and experience did not otherwise qualify them to participate in the Medicare program. Other information is given about independent laboratories and their compliance with Medicare's conditions of coverage.

16. Brown, Roma, MT(ASCP), Career Mobility: An Inquiry by a Health Profession Organization. Paper read at the annual meeting of the Association of Schools of Allied Health Professions, Nov. 1969.

Considering the role of professional organizations in developing career mobility, the author examines how the concept of career mobility applies in the recruitment phase, the commitment phase, the training and education phase, and the job performance phase of an individual's health career. She calls for mechanisms to recognize increased competency and give credit toward the next higher formalized level of achievement. Miss Brown is President of the American Society of Medical Technologists.

17. "Canadian Laboratory Leader Details Progress in Field," Lab World, Oct. 1969, pp. 1270-71.

An interview with Peter Hills, president of the Canadian Society of Laboratory Technologists, in which he describes the training and certification of laboratory personnel in Canada.

18. Levine, Harold G., "Career Ladders and Equivalency Examinations: What Does It All Mean?" American Journal of Medical Technology, Vol. 35, No.11, Nov. 1969, pp. 714-720.

The Director of Education of the A.S.M.T. says that while individuals who have mastered skills outside of formal educational programs should receive credit for them, it is difficult to implement this idea.

Tests can be developed to evaluate knowledge and the application of knowledge, and to demonstrate skill in handling equipment. But it is difficult to measure the development of professional

attitudes toward the role of professionals: "to perform to the best of their ability at all times, to maintain their skills, and to demand that their services be used appropriately." A college degree may be the only available assurance that an individual is likely to have developed such attitudes. But he should obtain college credit for the learning he can demonstrate through equivalency examinations.

19. Manpower for the Medical Laboratory: Proceedings of a Conference of Government and the Professions. Washington: U.S. Department of Health, Education, and Welfare, 1967.

Subtitled "The National Conference on Education and Career Development of the National Committee for Careers in Medical Technology," this October 1967 meeting brought together 200 of the nation's leading pathologists and medical technologists, clinical chemists and microbiologists, public health and manpower specialists, occupational analysts, hospital administrators, educators and testers, scientists and economists. The objective was to review the forces that are changing manpower requirements for medical laboratories and explore ways of staffing to meet the needs more effectively.

A major topic for consideration was career mobility and equivalency in the laboratory field, with general agreement that the former must be put into effect by means of the latter. It was recommended that efforts to made to encourage recognition of present equivalency tests by colleges and universities, and that "representatives of medical laboratory disciplines should initiate efforts with educational testing specialists to develop equivalency tests to provide increased mobility between levels and categories of laboratory careers."

The necessary step preceding equivalency test development would be job analysis, which the conference group called for as its first recommendation.

20. Peery, Thomas M., Laboratory Medicine: Careers and Challenges. Presidential Address delivered at the Annual Meeting of the American Society of Clinical Pathologists, Chicago, Ill., Sept. 18, 1969.

Making a strong plea for career mobility and better utilization of laboratory personnel, the A.S.C.P. 1968-69 President describes the career ladder as it could be in the medical laboratory. He places particular emphasis on careful planning for the first rungs of the ladder, so that they may be firm bases for future upward steps. And he advocates single-category programs on the lowest level, which an individual could combine over a period to form the equivalent of training as a medical technologist.

21. Prediction of Job Performance for Negro and White Medical Technicians. Princeton, N.J., Educational Testing Service, 1969.

Pike, Lewis W., "Development of the Instrumentation," April 1969
Flaugher, Ronald L., Campbell, Joel T., and Pike, Lewis W., "Ethnic Group Membership as a Moderator of Supervisor's Ratings," April 1969
Campbell, Joel T., Pike, Lewis W., and Flaugher, Ronald L., "A Regression Analysis of Potential Test Bias: Predicting Job Knowledge Scores from an Aptitude Battery," April 1969
Flaugher, Ronald L., and Norris, Lila, "Ethnic Group Membership as a Moderator of Supervisory Ratings," Sept. 1969
Campbell, Joel T., "A Regression Analysis of Test Bias: Predicting Job Knowledge Scores from an Aptitude Battery," Sept. 1969
Pike, Lewis W., and Mahoney, Margaret H., "Cross-Ethnic Cross Validation of Aptitude Batteries," Sept. 1969
Rock, Donald A., and Evans, Franklin R., "Aptitude and Rating Factors of Negroes and Whites," Sept. 1969

These constitute the reports to date of a project jointly sponsored by the U.S. Civil Service Commission and the Educational Testing Service aimed at identifying tests which are good predictors of job performance and which do not discriminate against certain cultural subgroups.

The first three listings are comprehensive progress reports published by the Educational Testing Service in April 1969. The four following listings are papers given at a symposium of the American Psychological Association in Washington, D.C., on Sept.2, 1969.

22. Reports on Retraining Medical Technologists. Washington, D.C.: National Committee for Careers in Medical Technology, May 1967.

The summary of work performed under a contract to "locate inactive medical technologists, promote their return to employment and develop guidelines for the retraining of these inactive medical technologists."

The summary includes a section on evaluation of re-trainees, in which the Steering Committee states that "conventional test instruments in medical technology have little meaning in evaluating retrainee achievement." The Committee advised either that no formal evaluation be administered or that new types of test instruments be developed. Samples of possible new test instruments are included in the report.

23. Schaeffer, Morris, Widelock, Daniel, Blatt, Sylvia, and Wilson, Marion E.; "The Clinical Laboratory Improvement Program in New York City. I. Methods of Evaluation and Results of Performance Tests," Health Laboratory Science, Vol. 4, No. 2, April 1967, pp. 72-89

A report on the first phase of a two-year evaluation of capabilities of all the laboratories in New York City, and the factors which relate to quality of performance. The study concludes that laboratories which perform well consistently are those staffed with highly trained, full-time supervisors who provide a close watch over the technical procedures.

24. Wise, Sarah Allene, MT(ASCP), A Method for the Preparation of a Challenge Examination in Medical Technology. An unpublished master's degree thesis, University of Vermont, Burlington, Vermont, May 1969.

This thesis reports on a project in which the author set out to prepare an equivalency examination in medical technology, to tests it on a varied sample of students, recent graduates and working laboratory personnel, and to evaluate it as an instrument for providing academic credit or partial fulfillment of the requirements for a specific level of employment.

Using educational objectives derived from the medical technology program at the University of Vermont, she selected test items which would evaluate the behavioral change involved in each objective. She attempted to include a representative sampling of questions on facts, theories and interrelationships, and of questions requiring recall, understanding or application, and evaluation or judgment.

She administered the resulting challenge examination to a group of seniors entering the professional medical technology courses at the University of Vermont, to a group recently graduated from those courses, and to a varied group of personnel working in medical laboratories.

The test was divided into four subject matter portions, each taking about an hour to complete: biochemistry, clinical microscopy (including histology and urinalysis), hematology-immunohematology (including hematology, coagulation, blood bank, and serology), and microbiology (including microbiology and parasitology.)

The collected data were subjected to various types of item analysis. A determination of reliability was made by the split half method. And means and standard deviations were calculated for each group and compared.

A major conclusion that could be drawn was that means for recent graduates could be differentiated from the means for entering seniors: the graduates were significantly higher on all four sections of the test. Other comparisons, however, were influenced by too many factors to make conclusions valid. While the reliability was good for most of the tests, the over-all validity of the challenge examination was low.

Some of the test items were too easy. And the balance of items was not what the author had hoped for; in particular, there was a lack of items requiring judgment and involving interrelationships.

Some of the other difficulties involved in preparing a challenge examination were brought out by Miss Wise in her recommendations:

"A new revised equivalency test should be prepared, involving more than one person in its preparation. The composition of the tests should be reviewed and improved. Administration under standard conditions to larger groups representing levels of employment within the laboratory will provide much more valuable data for future use. In addition to tests which evaluate the cognitive domain, tests should be available which evaluate the affective and psychomotor domains of learning.

"These findings and recommdnations emphasize the statement that the Challenge Examination used in the pilot study is a beginning. Using items from this examination and implementing the recommendations for improvement, a new and improved equivalency examination can be constructed for use in medical laboratories."

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25. Charvat, Josef, McGuire, Christine, and Parsons, Victor, A Review of the Nature and Uses of Examinations in Medical Education (Public Health Paper No. 36). Geneva: World Health Organization, 1968.

A summary of world-wide practices, listing advantages and disadvantages of the various types of examinations. The authors conclude there is too much emphasis on evaluation of a very limited aspect of knowledge -- the ability to recall isolated fragments of information -- but that some medical educators are making efforts to make examinations more inclusive. A section of new techniques in testing includes examples of new designs in conventional formats, of simulation techniques, and of attempts to standardize practical tests.

The Appendix includes a report on the possibility of an international qualifying examination for achieving equivalence in medical education.

26. Cowles, John T., "A Critical Comments Approach to the Rating of Medical Students' Clinical Performance", Journal of Medical Education. Vol. 40, Feb. 1965; pp. 188-198.

A rating form used as a "Clinical Performance Record" at the University of Pittsburgh School of Medicine was devised by collecting "critical comments" -- a variation of the critical incident technique.* Comments about each individual were pooled to give a good verbal picture of that individual.

27. The Evaluation of Complex Educational Outcomes. Springfield, Illinois: Illinois Department of Educational Research, 1968.

New techniques for assessing clinical competence of orthopaedic surgeons, developed as part of the Orthopaedic Training Study, are described and their validity and reliability analyzed. They are the "Simulated Patient Management Problem," a written simulation exercise, and two oral exercises: the "Simulated Diagnostic Interview" and the "Simulated Proposed Treatment Interview." Each was found to contribute to over-all assessment of clinical competence.

* See #97 in this Bibliography.

28. Hubbard, John P., Levit, Edithe J., Schumacher, Charles F., and Schnabel, Truman G., Jr., "An Objective Evaluation of Clinical Competence," New England Journal of Medicine, 272: 1321-1328, June 24, 1965.

Subtitled "New Technics Used by the National Board of Medical Examiners," this article describes the development and use of the new Part III clinical competence examinations of the National Board.

The definition of clinical competence was compiled by use of the critical incident technique, and three new examinations were developed to evaluate that competence: (1) motion pictures of patient examinations, with accompanying questions, (2) pictures and graphs for the recognition and interpretation of clinical situations, and (3) programmed testing, simulating situations in which diagnosis and treatment are required, with each decision building on the result of the decision before.

29. Instructions for Constructing Test Items in Health Education. New York: Professional Examination Service, American Public Health Association, 1968.

This booklet is distributed by the Professional Examination Service as a guide to the thousands of professionals in the health fields who help write questions for use in its many examinations. It includes examples of multiple-choice questions of varying complexities, and deals with the ways of composing such questions.

30. Long, Lillian D., Testing and Evaluation in Job Redesign and Manpower Utilization. Paper given at a Job Redesign and Manpower Utilization Seminar, Arlington, Va., Nov. 1968.

A discussion by the Director of the Professional Examination Service of the American Public Health Association of various ways in which testing and evaluation can be used in the health professions.

Proficiency testing, she says, "generally refers to a measure of the degree of acquired skill in a task that yields a readily observable product." Equivalency testing "poses such questions as, 'Has the work experience of this person who lacks formal training given him a competency equal to that of a person with formal training?'" The question is meaningless unless there is a clear-cut analysis of job functions, and a direct measure of competency of the person with formal education. The paper describes the PES development of an examination for non-degree directors of independent laboratories to permit them to qualify under Medicare, and also deals with the use of tests and other methods to evaluate members of disadvantaged groups for employment.

31. Maquire, Christine H., "The Oral Examination as a Measure of Professional Competence," Journal of Medical Education, Vol. 41, March 1966, pp. 267-74.

This study of an oral examination for orthopaedic surgeons looks at the popular view that the oral examination as currently employed measures "how a candidate thinks." The majority of the test was actually aimed at recall. Weighing its high cost against its low reliability and validity casts doubt on this type of testing as presently done.

32. Miller, George E., "The Orthopaedic Training Study," J.A.M.A., Vol. 206, No. 3, Oct. 14, 1968, pp. 601-606.

A description of the massive study underway at the Center for the Study of Medical Education of the University of Illinois for the American Board of Orthopaedic Surgery, under which the education of orthopaedic surgeons is being reviewed, and old and new forms of evaluating are being developed and tested, and incorporated into the Board's certification exams.

33. Miller, George E., Ed., Teaching and Learning in Medical School. Cambridge, Mass.: Harvard University Press, 1961.

This text includes a major section on "The Evaluation of Learning" of five chapters detailing the problems involved in evaluating student progress toward determined objectives, and the techniques which can be used in appraising that progress.

The chapter on measuring knowledge outlines advantages, disadvantages and suggestions for use of essay examinations, oral examinations, and the various types of objective examinations. The chapter on measuring performance includes observational methods, anecdotal records, check lists, and rating scales. The chapter on measuring attitudes describes interview techniques and the possible use of the log-diary. A final chapter mentions other techniques such as questionnaires, peer ratings, filmed interviews, and problem solving tests.

34. Monroe, Russell R., "Techniques for Evaluating the Effectiveness of Psychiatric Teaching," American Journal of Psychiatry, Vol. 122, July 1965, pp. 61-67.

A 40-minute filmed interview has been used in testing second-year medical students taking courses in psychiatry. At 28 points in the interview being conducted by an inexperienced psychiatrist, artificial breaks are made in the film, and each candidate is asked. "What would you do?" At the end, 20 questions testing clinical evaluations of the patient in the film are also asked.

35. Rimoldi, H.J.A., "Rationale and Applications of the Test of Diagnostic Skills," Journal of Medical Education, Vol. 38, No. 5, May 1963, pp. 364-68.

The Test of Diagnostic Skills was an attempt to test problem solving ability -- "thinking" -- by giving a clinical case history along with questions the candidate may ask. Scoring was based on which questions he chose, in what order. This was a predecessor of the National Medical Board's "programmed testing."

36. Williamson, John W., "Assessing Clinical Judgment," Journal of Medical Education, Vol. 40, Feb. 1965, pp. 180-187.

A description of a "Patient Management Problems" test in which the candidate goes step by step through a simulated case, making decisions and erasing overlays which give him further information and instructions.

Criteria to measure his performance against are developed by specialists. His score is computed as a Competence Index indicating percentage of overall agreement with criterion judgment. The overall score is a combination of the Efficiency Index, which measures the quality of the process (percentage of selections classified as "helpful") and the Proficiency Index, which measures the quality of the product (percentage of agreement with the criterion group in selecting beneficial procedures and avoiding harmful interventions).

37. Young, Jimmy A., Career Mobility: An Inquiry By An Allied Health Practioner. Paper read at the annual meeting of the Association of Schools of Allied Health Professions, Nov. 1969.

This paper describes a plan for a career ladder in the field of respiratory therapy, and an equivalency examination program devised by faculty members of the Inhalation Therapy Program at Northeastern University. The examination will be used to evaluate knowledge and skills gained by non-traditional means, and will make it possible for those working in the field to obtain academic credit for their present knowledge and performance.

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38. Baccalaureate Education for the Registered Nurse Student: Proceedings of a Conference. New York: National League for Nursing, 1966.

This book contains the papers given at a conference called to consider the problems of Registered Nurses returning to school to obtain their baccalaureate degrees. These papers include: An analysis of college-credit for off-campus learning and a report on the New York College Proficiency Examination Program, by Norman D. Kurland; a plea by the Rev. Carl A. Hangartner, S.J., that equivalency tests examine what a student needs to know, not try to fit what he does know into on-campus course offerings; a description of credit-by-examination programs at Cornell University College of Agriculture, and at nursing departments of the California State College at Los Angeles and of Indiana University.

39. Burnside, Mrs. Helen, "Practical Nurses Become Associate Degree Graduates," Nursing Outlook, Vol. 17, No. 4, April 1969, page 47.

A description of the credit-by-examination program of the Department of Nursing at Cuyahoga Community College in Cleveland. Such credit has been offered since 1967; students to whom such credit has been given have presented no problem.

40. Flanagan, John C., Gosnell, Doris, and Fivars, Grace, "Evaluating Student Performance," American Journal of Nursing, Vol. 63, No. 11, Nov. 1963, pp. 96-99.

An account of how the critical incident technique* was used at a nursing school in Pittsburgh to develop a list of desirable attributes for nursing students. From 2,073 incidents collected and classified, a reporting form was developed that called for notations about observed behavior.

41. Gerchberg, Louise Rozario, An Observational Method for Evaluating the Performance of Nursing Students. New York: National League for Nursing, 1962.

A report describing a trial application of a program for evaluating the performance of students of nursing in clinical situations. The program was based on a clearly defined set of clinical objectives. Four methods of behavioral observation were included: direct observation by teacher; assignment to the student of responsibility for planning a program of nursing care; maintenance by the student of a nursing diary; and process recording, a reconstruction in writing of the exact words of the nurse and patient, accompanied by the student's later interpretations of the interchange.

* See #37 in this Bibliography.

42. Grant, E. Louise, "The RN Writes Her Own Transfer Credit," Nursing Outlook, Vol. 14, No. 5, May 1966, pp. 39-40.

An explanation of the credit-by-examination program for RN's returning for degrees at the Medical College of Georgia School of Nursing, by the Dean. RN's may take "validation examinations" for up to seven courses totalling 59 quarter hours credit.

43. Heslin, Phyllis, "Evaluating Clinical Performance," Nursing Outlook, Vol. 11, No. 5, May 1963, pp. 344-345.

A review of some of the problems involved in evaluating clinical performance. The most important goal is to reduce the subjectivity of direct observations, which can be done by giving operational definitions of desired qualities and of measurable behavior that demonstrates each quality.

Questions to be answered are these: What are the functions of the group to be evaluated? What observable qualities are essential to effective performance of these functions? What standards can be used to define level of performance for each quality? What specific behaviors demonstrate each quality?

A good evaluation must be based on meaningful anecdotal records.

44. "Let's Examine the Challenge Examination for the Registered Nurse Student," Nursing Outlook, Vol. 17, No. 4, April 1969, page 48.

Questions and answers regarding the credit-by-examination system at the University of Arizona College of Nursing. A student may challenge any course, if he has the prerequisites for it. Of 60 units of credit allowed by the University, 30 may be accumulated by examination in the College of Nursing.

45. Lyons, William, and Schmidt, Mildred S., "Credit for What You Know," American Journal of Nursing, January 1969, pp. 101-104.

A history of the New York State College Proficiency Examination Program and its examinations for nurses. "... It is this unconditional admission of any individual who believes he has proficiency in a subject that is the essential ingredient of the program."

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A process developed at the University of Hawaii for rating student performance in clinical practice, by comparing anecdotal records on individual performance against a faculty-written list of expected behaviors.

47. Ramphal, Marjorie, "Needed: A Career Ladder in Nursing," American Journal of Nursing, Vol. 68 No. 6, June 1968, pp. 1234-1236.

A professor at the Graduate School of Nursing, New York Medical College, speaks up for more clearly defined nursing positions, and more mobility between them for those whose motivations and life situations change.

48. Slater, Doris, The Slater Nursing Competencies Rating Scale. Detroit, Mich.: Wayne State University College of Nursing, 1967.

This rating scale was developed with a view to enhancing objectivity in ratings of nurse performance in the clinical setting. Evaluation is done through rating skills displayed in many specific nurse-patient interactions, on an 84-item scale. Items can be combined in various ways to obtain ratings on various objectives.

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A description of rating scales for use of head nurses evaluating performance of staff nurses, emphasizing expected behavior, based on past observations, which must be briefly noted.

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A previously constructed rating form was tested to determine its validity, reliability, and practicality. The rating form asks for predicted behaviors, based on past experiences. While no firm conclusions could be drawn, the experience indicated further work with this type of form is needed and justified.

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A description of the College-Level Examination Program of the College Entrance Examination Board. Its primary goal is to facilitate access to higher education. There are perhaps 30 million people studying on their own, possible future test takers.

52. Arbolino, Jack N., The Council on College-Level Examinations. New York: College Entrance Examination Board, 1965.

This background report documents the need for methods of evaluating off-campus learning for academic credit and presents a plan for development by C.E.E.B. of a College-Level Examination Program, which has since been established under Mr. Arbolino's direction.

53. Carver, Fred D., "A Re-Entry Route for Yesterday's Dropouts," Adult Leadership, April 1967, pp. 357-358.

A report on the use of the General Educational Development tests by the U.S. Armed Forces Institute. In a 1965 survey, 64,684 certificates were issued in 1963-64 by state officials in 33 reporting states. Since other states, and also high schools and other agencies give equivalency for GED tests, the estimated total was 100,000.

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College-Level Examination Program, Description and Uses, 1968
Progress Report, January 1969
A Description of the General Examinations, 1968
A Description of the Subject Examinations, 1969
Bulletin of Information for Candidates, 1969-70
Score Interpretation Guide, 1967

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55. Community Action Curriculum Compendium. Washington: National Student Association, 1968.

A descriptive listing of college and university programs which include field work, tutorial work, and other types of community action, usually in conjunction with academic study, and for college credit.

56. Continuing Education Programs and Services for Women. Washington: U.S. Department of Labor, Wage and Labor Standards Administration, Women's Bureau, Jan. 1968.

A directory of college programs specially designed for women, including information about whether they allow credit for life experience - as nine of the listed colleges say they do.

57. Dyer, H.S., and Valley, J.R., Credit for Off-Campus Achievement. Princeton, N.J.: Educational Testing Service, Oct. 1962.

This paper proposes a program to give direction and substance to the efforts of people engaged in off-campus studies by providing comprehensive examinations aimed at giving academic credit for such studies. Of 50 million people estimated to be participating in adult education, several million might welcome such a system of examinations for credit. A review of various methods of off-campus study is included, and an analysis of college practices in granting credit by examination.

58. Flaugher, Ronald L., Mahoney, Margaret H., and Messing, Rita B., Credit by Examination for College-Level Studies: An Annotated Bibliography. New York: College Entrance Examination Board, 1967.

This very comprehensive bibliography includes sections on (1) the transfer student, (2) students receiving credit by examination, and (3) the unaffiliated student and sources of instruction open to him.

59. Hangartner, Rev. Carl A., S.J., "College Credit Equivalency and Advanced Standing," Nursing Outlook, Vol. 14, No. 5, May 1966, pp. 30-32.

Speaking at the National League for Nursing Conference on Baccalaureate Education, Father Hangartner suggested that measureable goals can be established for the outcomes of educational programs, and that students be evaluated against such goals to determine what more they need to learn rather than to equate their past learning with certain prescribed course offerings. A school offering credit by examination in this manner would identify what else the individual nurse, for instance, needs to qualify for its degree and then plan for her a program of courses and independent study aimed at making up her deficiencies.

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The registrar and secretary of the British Council for National Academic Awards describes its program for awarding advanced research degrees to individuals at institutions other than universities who do not possess the usual entry qualifications to register for an advanced degree. This program opens the door "for the working scientist or technologist without a degree, who, having achieved a position of some responsibility in industry by virtue of ability and experience, is anxious to obtain a formal high level academic qualifications." The candidate works under supervision of a board, prepares a thesis, and submits to oral examination.

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The report of a questionnaire study of the policies of 301 colleges and universities in the North Central Association regarding granting credit by examination.

62. Kurland, Norman D., College Credit by Examination for Off-Campus Study. Unpublished report prepared for the College Entrance Examination Board, April 1964.

A consultant's review of the need for and possibilities for developing an examination system for people who do college-level work outside of regular college programs. This paper describes some of the new college programs aimed at mature students, and suggests in some detail the course of action to be taken in setting up a national college-level examination program.

63. Kurland, Norman D., "College Credit for Off-Campus Learning," Nursing Outlook, Vol. 14, No. 5, May 1966, pp. 33-35.

A review for the NLN Conference on Baccalaureate Education of the emerging idea of recognition for out-of-course learning, and a brief history of the development of the New York College Proficiency Examination Program, which the author directed before becoming director of the Center on Innovation in Education, New York State Education Department. He suggests some of the questions the nursing profession must answer before embarking on a credit-by-examination program:

"(1) How much agreement is there among degree-granting institutions as to which courses make up a sound nursing program and what are the objectives of each course? (2) Can the objectives of the course be defined precisely in behaviorial terms? (3) Will nursing faculty agree to grant credit for examinations in their field? (4) Will students take the examinations? and (5) Can suitable examinations be devised to measure the performance aspects of nursing preparation?"

64. The New York College Proficiency Examination Program. Albany, New York: State Education Department, 1969.

This booklet describes the New York College Proficiency Examinations and their uses.

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A description of the GED (General Educational Development) Testing Program, the Comprehensive College Testing Program (predecessor of the College Entrance Examination Board's College Level Examination Program), and the courses and tests offered by the United States Armed Forces Institute.

Referring to the Comprehensive College Testing Program, the booklet quotes a resolution adopted in March 1964 by the Federation of Regional Accrediting Commissions: "That the Federation .... recommend to its constituent commissions, and through them to the institutions of higher education, responsible experimentation with these tests in connection with the increasing need for a program of continuing higher education for adult citizens and particularly as a basis for granting advanced standing or academic credit or both to qualified adults."

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One of the major issues considered in this study is: "How can learning regardless of how or where achieved, be given equivalent educational credit?"

The author states clearly that "methods must be devised to allow credit for learning in occupational programs for entry and advanced placement in general academic programs."

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This is the report of an Ad Hoc Committee on Allied Health Personnel of the Academy's Division of Medical Sciences. It examines the use of paramedical personnel in the military services and recommends ways to recruit these personnel for the civilian health field when they leave the military service. It mentions the Federal government's Project Transition and Project REMED, and indicates their limitations. Among its recommendations:

"That career patterns for supporting health-care personnel be so structured that a person can rise from one classification to another in his present specialty or enter a related field while receiving adequate credit for prior training, experience, and education."

"That adequate attention be given to methods of recruiting and retaining excorpsmen in the civilian health-care system; to pilot programs for developing adequate methods of evaluating the ex-corpsmen's existing skills, and programs for increasing those skills to meet specific technical and other job requirements; and to seeking the necessary changes in accreditation and licensing regulations and laws that at present often prevent the technically qualified person from meeting employment requirements."

68. Berlow, Colonel Leonard, "How to Recruit Military Personnel for Health Careers," Hospitals, Vol. 43, July 16, 1969.

An encouragement to the American Hospital Association members and others who read their journal to make efforts to hire the 30,000 to 50,000 qualified military health personnel now being lost each year to the civilian health field. The suggested procedures in this article actually deal with hiring long-term military personnel who are near retirement, but the principles remain similar for lower level personnel as well.

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A brief profile of the medical corpsman and his training, a look at some of the innovative programs developed to use these talents, and a review of the ways in which New Jersey might move to utilize this source of manpower through its Task Force on Health Manpower.

70. Granting Credit for Service School Training, Bulletin No. 8, Third Edition. Washington: Commission on Accreditation of Service Experience, American Council on Education, Sept. 1968.

This bulletin provides information and suggestions to college admissions officers concerning the evaluation of, and the granting of credit for, service school courses. In addition, it gives information on the advisory services of the Commission.

71. Lambert, Delores, and Carter, Jack L., Awarding of Credit by Civilian Institutions for Education in the Military. Rothwestern Army Education Center, 1969.

A listing by colleges, including information obtained from catalogs and questionnaires on whether they award credit for the following courses and examinations: U.S.A.F.I. courses, university correspondence courses, high school G E D tests, University of Maryland courses, Defense Language Institute courses, courses of other service schools, and College-Level Examination Program General Examinations.

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This report is based on a study of selected Air Force veterans and their transfer to civilian life. Since none of those whose experiences form the basis for this thesis were in the health occupations, this report is chiefly valuable to the present study for its inclusion of information about Project Transition, a Defense Department program to provide educational and training opportunities for men during their final months of service, and about Project REMED, specifically aimed at getting military health personnel into the civilian health fields.

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This volume contains the Commission's evaluations of and suggested academic credit ratings of formal service school training courses given from 1954 through February 1968. It also describes two national testing programs -- the General Educational Development Testing Program and the College-Level Examination Program.

75. Young, Colonel James J., Former Servicemen of the Army Medical Department: A Profile and Assessment of an Untapped Resource of Allied Health Manpower, Ph.D. thesis to be published 1970, University of Iowa, Iowa City, Iowa.*

Colonel Young's questionnaire for Army medical corpsmen released to the reserve in 1968 throws new light on the backgrounds and training of military medical personnel, and on their wishes to transfer to the civilian health field if credit were available for the fields they mastered in the service.

These men were likely to have had at least one year of college, to have been satisfied with their military training and their military health occupations, to be currently working in other than health fields as civilians. They view as barriers to employment in the civilian health fields the lack of recognition for their military training, and the fact that they therefore cannot meet the certification requirements in their field.

They indicated by large majorities that they would attend junior college if advanced standing were offered. And 84% said they would take an equivalency examination, if one were available, for educational purposes, while 78% said they would take such an examination for job placement.

* See Appendix 6, page 83.

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G. LICENSURE AND OTHER GOVERNMENTAL REGULATIONS

76. "Educational Qualifications of Public Health Laboratory Workers," American Journal of Public Health, Vol. 57, No. 3, March 1967, pp. 523-531.

This is the report of the Subcommittee on Educational Qualifications of Public Health Laboratory Workers (referred to as "The Hardy Committee" because it was chaired by Albert V. Hardy, M.D.) of the Committee on Professional Education of the American Public Health Association. It was prepared with the aid of the Laboratory Section (now Division) of the National Communicable Disease Center. A major effort to identify the classes of positions in public health laboratories, it examines the functions of such laboratories and recommends a series of five technical grades and seven professional grades. Although the highest technical grades commonly would have responsibilities equal to or greater than the entering professional grades, there is no provision for movement from one to the other without formal education. No job specifications are included in this report. The "Guide Class Specifications" (below) were designed to meet this need.

77. Egelston, E. Martin, and Kinser, Thomas, Exploratory Investigation of Licensure of Health Personnel. Chicago: American Hospital Association, 1969.

A general review of the licensing processes in health occupations, leading to the conclusion that "the licensing process, while worded in the legal definitions of consumer protection and practitioner qualifications, in reality is also a significant means for determining manpower entry, use, mobility and wage costs." Some of the problems associated with licensure are brought forward: e.g., difficulty of defining who can provide what kinds of treatment, restriction of entry into occupations where there are shortages of workers, emphasis in licensing examinations on recall of trivial facts or out-of-date information, the fact that hospitals in fact do use unlicensed personnel, and domination of licensing boards by members of the occupational group itself.

A number of suggested solutions to these problems are reviewed, including (1) careful evaluation of new licensure legislation, (2) the substitution of institutional licensing for the licensing of individuals, (3) establishment of a new national voluntary accrediting agency, or (4) the drafting of model minimum codes.

78. Frutchtl, Sister Martin Mary, S.S.M., "Should Medical Technologists be Licensed?," Hospital Progress, Vol. 47, No. 11, Nov. 1966, pp.47-54.

A comparison of laboratory personnel policies at Catholic hospitals in California, where licensing is required, and in New York, where it is not. About a quarter of the laboratory directors were indifferent to qualifications of personnel as long as the work is done satisfactorily. There was more diversity in New York in the qualifications of personnel employed. The author suggests licensure with categories of workers structured from top to bottom as the best assurance that laboratories will combine the talents of the highly trained and lower level personnel most effectively.

79. Guide Class Specifications for State Public Health Laboratories. Washington: U.S. Department of Health, Education and Welfare, Oct. 1969.

A joint project of a Committee of the Association of State and Territorial Public Health Laboratory Directors; the Division of Health Standards and Plans, Office of State Merit Systems, Department of Health, Education, and Welfare; and the Laboratory Division of the National Communicable Disease Center, drafting model position class specifications for public health laboratories for use by state governments. These specifications call for broad opportunity for entry into the lowest grades, for advancement via in-service training through two levels of aide positions and four or more levels of laboratory technician positions. The highest technician levels include duties and salaries above those of the normal college trainee entrance level. Professional education is considered essential, however, for the professional positions. This publication emphasizes that increased opportunities should be available to laboratory personnel to obtain that education through educational leave, fellowships, work-study and other training programs.

80. Hershey, Nathan, "An Alternative to Mandatory Licensure of Health Professionals," Hospital Progress, Vol. 50, No. 3, March 1969, pp. 71-73

The author suggests institutional licensing as a way to combat the problems which have arisen with personal licensing, and would give institutions the responsibility for regulating the provision of services.

81. Licensure of Clinical Laboratories and Personnel -- A Suggested Guide for Preparation of Enabling Legislation. Atlanta, Ga.: National Communicable Disease Center, Nov. 1966.

A model for state licensing legislation. Personnel qualifications are not included.

82. Quality in Health Care: Report of the 1968 National Health Forum. New York: National Health Council, 1968.

The three volumes of this report are: I, "Challenges and Definitions"; II, "Action Proposals and Discussions"; and III, "Priorities and Resources for Action." They include at least two papers touching on career mobility problems in relation to licensing.

In "Assuring High Quality in the Health Professions Through Licensure or Certification," Matthew F. McNulty, Jr., reviews the history of licensure, suggests the need for more citizen participation in the licensing process, states that licensure artificially restricts the supply and mobility of health manpower, and mentions the possibility of a National Presidential Commission on Licensure and Certification.

Edward H. Forgotson, in "Professional Accreditation, Certification, and Official Licensure as Assurances of High Quality Health Care," says the present system of personnel licensure operates as a barrier to innovations in the education and use of health manpower. He recommends a national program by the states (not the Federal government) to write licensure regulations that allow for development of new kinds of manpower and protect the public interest while such development take place.

83. "Regulation of Clinical Laboratories and Their Personnel," Suggested State Legislation -- Volume XXVIII. Chicago: The Council of State Governments, 1969.

A model for state licensing legislation. Personnel qualifications are not included.

84. Shimberg, Benjamin and Moe, John V., A Pilot Study to Determine the Feasibility of Investigating Nationally the Impact of Licensing Practices on the Availability and Mobility of Non-Professional Manpower in Occupations Where Skill Shortages Exist. Princeton, N.J.: Educational Testing Service, May 1968.

This study reports on licensing practices in five states for non-professional occupations in which manpower shortages exist. Clinical laboratory worker licensing is considered in only one of the states. The analysis of the effects of licensing concludes with the finding that "licensing does appear to inhibit both job entry and interstate mobility." Further in-depth research is recommended by the authors.

85. State Licensing of Health Occupations. Washington, D.C.: Department of Health, Education & Welfare (Public Health Service Publication No. 1758), 1967.

A summary of licensing requirements and procedures in 25 health occupations prepared by the National Center for Health and Statistics and including a section on "Clinical Laboratory Personnel."

TESTING IN EDUCATION AND INDUSTRIAL FIELDS

86. Baldwin, Thomas S., The Development of Achievement Measures for Trade and Technical Education. Raleigh, N.C. and Urbana, Ill.: North Carolina State University and University of Illinois, 1966-68.

An abstract and ten progress reports on a project calling for development of achievement tests in the following areas: electronics; electrical; radio and television; automechanics; machinist; air conditioning, heating and refrigeration; and data processing. Such tests, in addition to providing information about effectiveness of training programs, will serve as a tool for research on the aptitudes which are necessary for success, and provide an estimate of a student's probability of success on the job. The next report on the project will be the final report.

87. The Evaluation of Teaching. Washington, D.C.: Pi Lambda Theta, 1967.

Five papers and a colloquy on the possible ways to evaluate teaching through assessing the resulting student behavior in various circumstances.

88. Feasibility of Providing Trade Competency Examinations for Teachers on a National Basis. New Brunswick, New Jersey: Rutgers, The State University, 1967.

This is the report of a project which explored the feasibility of developing national competency examinations for evaluating the trade knowledge and skills of potential vocational education teachers. After a study of state examination programs for such persons, and two meetings bringing together delegates from 23 states, the consensus was that national trade competency examinations should be developed. This report includes four sets of papers:-- with the first author listed being the original author of the paper and the second, the "reactor":

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LaBounty, Ray A., and Billings, Donn, "A Limited Field Test of the Automotive Competency Examination"

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Shimberg, Benjamin, and Lofgren, Paul V.W., "The Performance Phase of Trade Competency Examinations"

89. Kazanas, H.C., and Kieft, L.D., "An Experimental Project to Determine More Effective Vocational Teacher Certification Procedures in Michigan by Competency Examinations." Ypsilanti: Eastern Michigan University, August, 1966.

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This is the final report of a two-year study of reliability and validity of three New York State competency tests -- for auto mechanics, cosemetology, and machine shop -- used in selecting candidates for teacher preparation in the trade and industrial programs.

The variability of difficulty levels was found to be extremely high.

On performance tests, comparison between judges rating applicants on performance showed a high relationship, and intercorrelations among sub-scores were high. The relationship between examination scores and actual experience in the occupation was examinated. Recommendations included: pooling test data from all parts of the state, and a plan for systematic review and updating.

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Using the critical incident technique* to analyze the job of store managers in a Swedish grocery company, the authors then studied the results of the technique itself, concluding the method did cover the essential points in the job, and that information collected by this method is both reliable and valid.

94. Cronbach, Lee J., Essentials of Psychological Testing. New York: Harper & Brothers, 1960.

An introduction to testing.

Chapter 13 on "Proficiency Tests", pp. 360-401, is of particular interest.

Since proficiency tests measure abilities produced on demand, to evaluate instruction fully, it is necessary to supplement proficiency tests with observations and other measures of typical behavior.

Recognition tests measure nearly as well as free-response tests. A test asking students to choose the best generalizations correlated .85 with actual ability to draw generalizations; a test calling for choice among alternate plans correlated .79 with a test of ability to make plans.

Low reliability is characteristic of work samples, where one error may disturb the entire sequence of performance. It is best to use a large number of short items, rather than a few complex ones. Observations are far from trustworthy.

Chapter 17 on "Judgments and Systematic Observations," pp. 506-538, discusses the limitations and possibilities in using rating scales. The "forced choice" type of rating scale aims at separating the job of describing behavior from the job of evaluating it. Generally, supervisors' ratings of job knowledge correlate only minimally with tests of that knowledge.

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* See #97 in this Bibliography.

96. Fitzpatrick, Robert, and Morrison, Edward J., "Performance and Product Evaluation," Chapter of forthcoming revision of Educational Measurement. Washington: American Council on Education, to be published 1970.

The authors describe the types of performance testing, such as situational tests, work samples, games, rehearsed performances, and diagnostic problem-solving tests.

They indicate some of the uses to which such tests have been put. And they deal with the steps involved in constructing such tests: (1) definition of objectives, (2) outline of the general concept of the tests, (3) preparation of test content (a sampling with a variety of short items), (4) preparation of stimulus aspects (instructions and physical setup), (5) consideration of response aspects (use of equipment or performance aids, and the decision whether to evaluate performance or product or both), (6) maintaining good test conditions (training examiners, maintaining equipment, test security, observing and recording performance), and (7) methods of scoring.

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101. Smith, Robert G., Jr., An Annotated Bibliography on Proficiency Measurement for Training Quality Control. Alexandria, Virginia: Human Resources Office, June 1964.

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ORGANIZATIONS AND INDIVIDUALS SUPPLYING INFORMATION FOR THIS STUDY

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